Assessment Activities

Summaries of Recent Completions and Current Work

New Undertakings Since June 1986

- Technology, Innovation, and U.S. Trade (p. 18)
- Seismic Verification of Nuclear Test Limitation Treaties (p. 23)
- Mapping the Human Genome (p. 33)
- Technology and Public Policy To Enhance Grain Quality in International Trade (p. 37)
- The Quality of Medical Care: Information for the Consumer (p. 47)
- Diagnostic Medical Tests: Impact on Public and Private Policies Toward Health Care (p. 48)
- Nontraditional Methods of Cancer Management: Science and Policy Issues (p. 57)
- Science, Technology, and the Constitution in the Information Age (p. 65)
- Communication Systems for an Information Age (p. 65)
- New Clean Air Act Issues (p. 70)
- Safety in the Commercial Aviation and Motor Carrier Industries (p. 79)
- Educational Technology: An Assessment of Practice and Potential (p. 80)

January 1987

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Office of Technology Assessment

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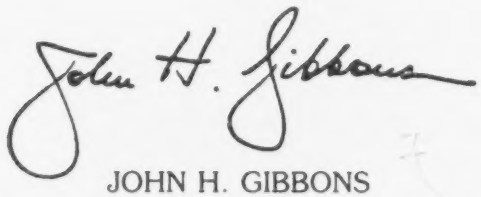
Preface

This booklet is designed to provide Members of Congress and their staffs with summaries of ongoing and recently completed work.

The projected publication dates for ongoing work are our best current estimates but they are subject to change both to allow for uncertainties inherent in research, and because OTA must frequently shift its priorities to match evolving congressional needs.

Legislative deadlines often require OTA to release specific information from an assessment before completion of the project. Frequently this information is conveyed through a staff briefing, testimony, a special report, or a technical memorandum. If Members of Congress or congressional staff are interested in these activities, they should note that appropriate names and phone numbers are listed with each ongoing project summary.

For additional copies of this booklet or information on other OTA publications, please contact our Publications Request line (202) 224-8996.



JOHN H. GIBBONS
Director

Office of Technology Assessment (OTA)

OTA is a nonpartisan analytical support agency that serves the United States Congress by providing congressional committees with analyses of emerging, difficult, and often highly technical issues. Governed by a 12-member bipartisan, bicameral Congressional Technology Assessment Board (TAB)—six Senators and six Representatives—OTA provides a variety of services to the Senate and House on a broad range of issues. Services sometimes include briefings, testimony, and special reports on major assessments—some requiring more than 2 years to complete. OTA explores complex issues involving science and technology, helping Congress to resolve uncertainties and conflicting claims, identifying alternative policy options, and providing foresight or early alert to new developments that could have important implications for future Federal policy. OTA does not advocate particular policies or actions, but points out their pros and cons and sorts out the facts.

OTA's multidisciplinary staff plans, directs, and drafts all assessments. It draws extensively on the broad technical and professional resources of the private sector, including the academic community, public interest groups, State and local government, and the citizenry at large.

Categories of Documents Issued by OTA

OTA Reports are the principal documentation of formal assessment projects. These projects are approved in advance by the Technology Assessment Board. **Special Reports** are relatively short OTA reports on topics of direct relevance to specific legislation, oversight, or other congressional action. Both types of documents are expected to present policy options and findings with considerable policy significance. The Technology Assessment Board has the opportunity to review Reports and Special Reports before release but this does not necessarily imply endorsement of the results by the Board or its individual members.

OTA Technical Memoranda are issued at the request of committees or Members of Congress on specific technical subjects that are relevant to current congressional legislation or oversight.

OTA Background Papers, Case Studies, and Workshop Proceedings are documents that contain information that supplements formal OTA assessments or is an outcome of internal exploratory planning and evaluation. The material is usually not of immediate policy interest such as is contained in an OTA Report or Technical Memorandum, nor does it present options for Congress to consider.

Assessment Requests and Approvals

According to the Technology Assessment Act, requests for OTA assessments may be made by the chairman of any congressional committee acting for himself, or at the request of a ranking minority member or, a majority of the committee members; by the Board; or by the OTA Director in consultation with the Board.

The Board decides whether or not OTA will undertake a requested assessment. First, the OTA staff analyzes the request to determine what resources and time it might require and what modifications it might need to suit OTA's resources and congressional needs. The staff then presents a formal proposal to the Board, which makes the final decision.

Table of Contents

Page

ENERGY AND MATERIALS

Magnetic Fusion Research and Development 7
New Electric Power Technologies 8
Nuclear Power in an Age of Uncertainty 8
U.S. Natural Gas Availability 9
U.S. Vulnerability to An Oil Import Curtailment 9
Competitiveness of Domestic Copper 10
Western Surface Mine Permitting and Reclamation 10
Potential Effects of Section 3 of the Federal Coal Leasing Amendments Act of 1976 11
High-Technology Ceramics and Polymer Composites 12
Technologies for Prehistoric and Historic Preservation 12
Technological Risks and Opportunities for Future U.S. Energy Supply and Demand 13

INDUSTRY, TECHNOLOGY, AND EMPLOYMENT

Strategic Materials 14
Superfund Strategy 14
Serious Reduction of Hazardous Waste 15
Technologies and Management Strategies for Hazardous Waste Control 16
Technology and Structural Unemployment 16
Plant Closing 17
Displaced Homemakers 18
Technology, Innovation, and U.S. Trade 18
International Competition in the Service Industries 19
Trade in Services 20

INTERNATIONAL SECURITY AND COMMERCE

Space Stations and the Law 21
International Cooperation and Competition in Civilian Space Activities 21
Technology Transfer to the Middle East 22
Technology Transfer to China 22
Seismic Verification of Nuclear Test Limitation Treaties 23
Strategic Defense Initiative 23
Ballistic Missile Defense Technologies 24
Anti-Satellite Weapons, Countermeasures, and Arms Control 24
The Effects of Nuclear War 24
International Competitiveness in Electronics 25
Alternatives for Improving NATO's Defensive Response 25
Technologies for NATO's Follow-On Forces Attack Concept 26

TECHNOLOGY AND ECONOMIC TRANSITION—A SPECIAL PROJECT

Technology and the American Economic Transition 27
Technology, Trade, and the U.S. Residential Construction Industry 28

BIOLOGICAL APPLICATIONS

Technology and Aging in America 29
Hearing Impairment and Elderly People 29
Classification Systems for Critical Care for Elderly Patients 30
Impacts of Neuroscience 31
Life-Sustaining Technologies and the Elderly 31
Losing a Million Minds 32
Surrogate Decisionmaking for Elderly Individuals 32

Page

New Developments in Biotechnology 33
Mapping the Human Genome 33
Commercial Biotechnology 34
Impacts of Applied Genetics 34
Human Gene Therapy 35
Infertility Prevention and Treatment 35
Reproductive Health Hazards in the Workplace 36
Alternatives to Animal Use in Research, Testing, and Education 36

FOOD AND RENEWABLE RESOURCES

Innovative Biological Technologies for Lesser Developed Countries 37
Africa Tomorrow 37
Technology and Public Policy To Enhance Grain Quality in International Trade 37
Low-Resource Agriculture in Africa 38
Agricultural Development in the Sahel 39
Integrated Renewable Resource Management for U.S. Insular Areas 39
Technologies To Benefit Agriculture and Wildlife 40
Technology, Public Policy, and the Changing Structure of American Agriculture 40
A Special Report for the 1985 Farm Bill 41
Technologies To Maintain Biological Diversity 41

HEALTH

Preventing Illness and Injury in the Workplace 43
Federal Policies and the Medical Devices Industry 43
Medical Devices and the Veterans Administration 46
The Impact of Randomized Clinical Trials (RCTs) on Health Policy and Medical Practice 47
The Quality of Medical Care 47
Diagnostic Medical Tests 48
Strategies for Medical Technology Assessment 48
Blood Policy and Technology 49
Review of the Public Health Service's Response to AIDS 49
Monitoring AIDS-Related Activities 50
Technologies for Detecting Heritable Mutations in Human Beings 50
Medical Technology and Costs of the Medicare Program 51
Diagnosis-Related Groups (DRGs) and the Medicare Program 52
OTA's First Report on the Prospective Payment Assessment Commission (ProPAC) 54
OTA's Second Report on the Prospective Payment Assessment Commission (ProPAC) 54
Medicare's Prospective Payment System 54
Payment for Physician Services 55
Status of Biomedical Research and Related Technology for Tropical Diseases 56
Carcinogen Regulatory Policy 57
Nontraditional Methods of Cancer Management 57
Assessment of Technologies for Determining Cancer Risks From the Environment 58
Monitoring of Mandated Vietnam Veteran Studies 59
Technology and Handicapped People 59
Technology and Child Health 59
Children's Mental Health 60
Indian Health Care 61
Scientific Validity of Polygraph Testing 61

Table of Contents—Continued

	Page
Prospective Payment Assessment Commission	61
Physician Payment Review Commission	62
Abstracts of Case Studies in Health Technology Case Study Series	43
Nuclear Magnetic Resonance (NMR) Imaging Technology	44
The Boston Elbow	44
The Market for Wheelchairs	45
The Contact Lens Industry	45
The Hemodialysis Equipment and Disposables Industry	46
Technologies for Managing Urinary Incontinence	46
The Effectiveness and Costs of Alcoholism Treatment	51
Intensive Care Units	52
The Cost-Effectiveness of Digital Subtraction Angiography in the Diagnosis of Cerebrovascular Disease	53
The Effectiveness and Costs of Continuous Ambulatory Peritoneal Dialysis	53
Effects of Federal Policies on Extracorporeal Shock Wave Lithotripsy	55
Nurse Practitioners, Physician Assistants, and Certified Nurse-Midwives	56
COMMUNICATION AND INFORMATION TECHNOLOGIES	
Information Technology Research and Development	63
Artificial Intelligence R&D/Machine Translation of Scientific and Technical Information	63
Scientific Use of Supercomputers	63
Microelectronics Research and Development	64
Automation of America's Offices	64
Computerized Manufacturing Automation	64
Science, Technology, and the Constitution in the Information Age	65
Communications Systems for An Information Age	65
Intellectual Property Rights in an Age of Electronics and Information	66
Federal Government Information Technology: Electronic Surveillance and Civil Liberties	66
Federal Government Information Technology: Management, Security, and Congressional Oversight	67
Federal Government Information Technology: Electronic Record Systems and Individual Privacy	67
Federal Government Information Technology: The Social Security Administration and Information Technology	68
New Communication Technologies	68
Technology, Public Policy, and the Changing Nature of Federal Information Dissemination	69
OCEANS AND ENVIRONMENT	
New Clean Air Act Issues	70
Protecting the Nation's Groundwater From Contamination	70
Acid Rain and Transported Air Pollutants	71
Managing the Nation's Commercial High-Level Radioactive Waste	71
Technologies for Exploring and Developing U.S. Exclusive Economic Zones	72
Wastes in Marine Environments	72
Ocean Incineration	73
Oil and Gas Technologies for the Arctic and Deepwater	73
Assessment of Maritime Trade and Technology	74
Alternative Cargo Policies	74
R&D in the Maritime Industry	75
Marine Applications of Fuel Cell Technology	75
The Border War on Drugs	75
SCIENCE, EDUCATION, AND TRANSPORTATION	
Demographic Trends and the Scientific and Engineering Work Force	76
The Regulatory Environment for Science	76
Research Funding As An Investment	76
U.S.-Soviet Cooperation in Space	77
Civilian Space Stations and the U.S. Future in Space	77
Airport System Development	78
Technology, Innovation, and Regional Economic Development	78
Safety in the Commercial Aviation and Motor Carrier Industries	79
Transportation of Hazardous Materials	79
Transportation of Hazardous Materials: State and Local Activities	80
Educational Technology	80
Sustaining the National Technological Base	81
Index	82

Projects described in this booklet are presented in various forms—completed, in progress, and ongoing. Keywords are listed and provided for a quick and easy reference to descriptions; the form of the OTA document is given in parentheses following each title: Report (R), Technical Memorandum (TM), Background Paper (BP), Case Study (CS), Special Report (SR), and Workshop Proceedings (WP).

Summaries (when stated as available) can be obtained by calling (202) 224-8996.

Full reports are provided to Members and their staff for congressional use. Others interested in the full reports can purchase them from the U.S. Government Printing Office or through the National Technical Information Service. Refer to the current OTA Publications List (OTA-P-58) or call OTA's Publications Office (224-8996) for ordering information.

Energy & Materials (226-2144)

Magnetic Fusion Research and Development (R)

Thermonuclear fusion
Fusion power
Energy supply
International cooperation

Thermonuclear fusion, the process powering stars and hydrogen bombs, offers the prospect of providing a source of energy having an effectively unlimited fuel supply. Fusion power might turn out to be both safer and more environmentally acceptable than nuclear fission. Great progress in harnessing fusion has been made to date, but a great deal of additional work is required. The Magnetic Fusion Energy Engineering Act of 1980 envisaged, but did not appropriate, 25 percent real increases in fusion research funding for each of the following 2 years, and a doubling of the overall effort within 7 years. By fiscal year 1986, however, the magnetic fusion budget had fallen, in real terms, to two-thirds of the peak value it reached in fiscal year 1977.

Shrinking funding profiles are forcing a major reanalysis of the Department of Energy's magnetic fusion research program. OTA will examine the choices which need to be made concerning the fusion program, including: 1) how the fusion program serves at satisfying a number of different national goals (long-term energy supply, stimulation of technology, international scientific prestige, etc.); and 2) how the fusion program could be structured, including the role of international cooperation, once the program's goals and priorities have been decided.

Project Director: Gerald Epstein 226-2184.

Estimated publication date: Summer 1987.

Requested by: House Committee on Science and Technology
Senate Committee on Energy and Natural Resources

New Electric Power Technologies: Problems and Prospects for the 1990s (R)

Powerplants
Utility producers
Tax credits

Electric utilities are more constrained in their choice of generating technologies than they were a decade ago when they engaged in a massive construction program of large powerplants. At present, faced with uncertainties in electricity demand forecasts, utilities are avoiding commitments to complex, long lead-time large powerplants. The Federal Government has directly and indirectly encouraged the development of a series of new technologies that have in common the small size and short lead-times which in theory offer greater flexibility to utilities. Such new technologies include: utility-controlled load management, fuel cells, advanced coal- and gas-combustion technologies, photovoltaics, solar thermal power, wind, and geothermal.

This report examines the current and projected cost and performance of such technologies, and evaluates alternative options for accelerating their availability, which could be a prudent way to give utilities more supply choices in the 1990s. Among the options considered are an increased or refocused Federal role in research, development, and demonstration activities; cooperative efforts among utilities, industry, utility commissions, and government; and a number of revisions to existing Federal legislation.

Project Director: Peter Blair 226-2133.

Published: July 1985. Summary available.

Requested by: House Committee on Science and Technology

Nuclear Power in an Age of Uncertainty (R)

Atomic powerplants
Nuclear reactors

The nuclear reactor manufacturing industry is facing a period of extreme uncertainty. There have been no reactor orders since 1978, and it is quite possible that none will be placed in time to keep existing design and manufacturing capabilities intact. The principal reason has been the decline in electricity demand growth that has greatly reduced the near-term need for new generating capacity. Other factors and perceptions about nuclear power—e.g., safety concerns, costs, reliability questions—have also contributed to the industry's difficulties. In order for the nuclear option to be available, and to be acceptable to the utilities, regulators, and the public, substantial technical and institutional changes may be needed.

This assessment examines the major technical considerations about the future of conventional nuclear power and how these technologies can affect economic, regulatory, and institutional issues (e.g., government and industry responsibilities) that govern that option.

Technical issues studied include potential improvements to existing reactors such as higher fuel burn-up and increased reliability; reoptimized and standardized light water reactors; and different reactor types such as HTGR or CANDU reactors. The consequences of these possible changes on licensing, reactor costs, safety, industrial structure, and public perception are examined.

Project Director: Alan Crane 226-2105.

Published: February 1984. Summary available.

Requested by: Senate Committee on Energy and Natural Resources
House Committee on Science and Technology, and its Subcommittee on Energy Research and Production

U.S. Natural Gas Availability: Gas Supply Through the Year 2000 (R)

Natural gas
Energy production
Fossil fuels
Petroleum engineering

In the past few years there has been a change in the outlook about the potential for natural gas production in the lower 48 States. Recent optimistic projections by some groups have stimulated efforts to revise current natural gas policy so that natural gas can play a bigger role in reducing this country's oil imports. There remains, however, considerable uncertainty about how much the United States can rely on natural gas, which is tempering this optimism. This assessment is designed to help determine domestic (lower 48 States) natural gas availability over the next few decades, and to help understand the factors that affect this availability. The OTA assessment: 1) analyzes the key technical and physical parameters that determine the resource base and future production rates of all categories of natural gas, including so-called "unconventional sources" such as Devonian shale gas; 2) critically reviews current estimates of the resource base, and estimates the potential production rates of natural gas; and 3) analyzes the uncertainties in estimates of resources and production rates, and identifies those uncertainties that may be reduced with additional R&D.

Project Director: Steve Plotkin 226-2110.

Published: February 1985. Summary available. Interim publication:
"U.S. Natural Gas Availability: Conventional Gas Supply Through the Year 2000" (TM), published September 1983.

Requested by: Senate Committee on Energy and Natural Resources, and its Subcommittee on Energy Research and Development
House Committee on Energy and Commerce, and the Subcommittee on Fossil and Synthetic Fuels

U.S. Vulnerability to an Oil Import Curtailment (R)

Energy shortages
Energy industries
Fuel substitution

Over the next decade, it is possible that the Nation will experience a disruption in imported oil of a level that will exceed the capabilities of the Strategic Petroleum Reserve and seriously affect the economy.

This assessment examines the opportunities and problems that characterize various technical responses that could supplement the Strategic Petroleum Reserve to meet such an interruption. The objective is to determine what available resources might be expanded, the technical limitations for fuel substitution and switching, the physical constraints of stockpiling resources, and the impacts of accelerating the use of these technologies. Technologies to be considered include enhanced oil recovery, adapting industrial boilers to dual-fuel capacity, biomass production, high-voltage transmission, hydro, wind, direct solar, vehicle retrofits, photovoltaics, retrofitting building envelopes and heating/cooling systems, retrofitting vehicles to improve mileage efficiency, and switching capacity of petroleum refineries.

Key contact: Peter Blair 226-2133.

Published: September 1984. Summary available.

Requested by: Senate Committee on Foreign Relations

Competitiveness of Domestic Copper (R)

Domestic minerals
Copper mining
International trade
Materials substitution

Copper historically has been an important part of the domestic mineral industry and has contributed significantly to the economy, particularly in the Western United States. In recent years, however, a number of factors have combined to reduce the demand for domestic copper in favor of foreign sources of supply. The domestic costs of copper mining, smelting, and refining have risen at a time when there is a surplus in international copper supplies and a decrease in demand due to materials substitution. When combined with the effects of a strong dollar and foreign industry subsidization, plus relatively low domestic ore grades, these cost increases and market conditions have significantly reduced the ability of the domestic industry to compete with copper imports. As a result, domestic copper production is now at about one-half of U.S. capacity.

In order to identify the technical and economic issues related to the decline in competitiveness of the domestic copper industry, and to develop constructive alternatives to help revitalize the industry, OTA will: 1) assess the status of copper markets, including recent supply and demand trends and the extent to which they have been affected by substitutions; 2) identify possible future market trends, including the potential for further substitutions and/or new markets; 3) describe the technological and management state-of-the-art in copper mining, smelting, and refining (including byproduct utilization) and the cost shares for each sector; 4) assess, in the context of future market trends, advanced technologies and managerial strategies with the potential for reducing costs in each sector; and 5) identify options that could be implemented by government or private entities to revitalize the copper industry.

Project Director: Jenifer Robison 226-2134.

Estimated publication date: Fall 1987.

Requested by: The Technology Assessment Board
Congressional Copper Caucus

Western Surface Mine Permitting and Reclamation (R)

Coal reserves
Mining engineering

In the years since enactment of the Surface Mining Control and Reclamation Act (SMCRA), coal companies have made significant improvements in reclamation technologies and methodologies, and the prospects for the success of surface mine reclamation have brightened. Yet recent analyses have raised concerns about the use of data, models, and lease stipulations in the implementation of SMCRA. This study examines: 1) the methods for predicting and evaluating the success of reclamation practices, including an analysis of the levels and kinds of uncertainty in those methods and in the monitoring and other data that support them; 2) the relation between preleasing and postleasing tech-

nological or methodological requirements for environmental protection, including an analysis of the fate of lease stipulations intended to implement the environmental protection requirements of the Federal coal leasing program; 3) the encouragement given to the development and use of innovative and emerging reclamation techniques; and 4) the status of monitoring and research on mined land reclamation in the West, and how monitoring and other data are being used to support the activities in 1 through 3 above. The assessment identifies the uncertainties that remain to be resolved before judgments about the long-term success of Western surface coal mine reclamation can be made. It examines technical and policy options for improving the prospects for successful reclamation of Western coal lands.

This assessment also examines the success of special provisions in SMCRA relating to Prime Farmlands (published separately as a staff paper).

Project Director: Jenifer Robison 226-2134

Published: June 1986. Summary available.

Requested by: House Committee on Interior and Insular Affairs

Potential Effects of Section 3 of the Federal Coal Leasing Amendments Act of 1976 (SR)

Federal coal leasing policy
Onshore mineral leases
Onshore oil and gas
Competition
Energy supply

Section 3 of the Federal Coal Leasing Amendments Act of 1976 (FCLAA) forbids the issuance of any new Federal onshore mineral leases to any person or company that owns a Federal coal lease that is not producing coal in commercial quantities and has been held for 10 or more years. This disqualification also applies to all related business entities controlled by or under common control with the noncomplying coal lessee. The potential impacts of section 3 disqualifications extend beyond coal leasing to all Federal onshore mineral leases, and to onshore oil and gas leases in particular.

The first section 3 disqualifications were to begin in August 4, 1986, however, a provision in the Continuing Appropriations Resolution for Fiscal Year 1986, Public Law 99-190, delayed the effect of section 3 to December 31, 1986. Legislation to modify the section 3 penalty emerged from both House and Senate Committees in the 99th Congress, but did not reach the floor. These legislative proposals raise difficult issues involving Federal coal leasing policy, energy, supply, and competition.

This special report analyzes the potential effects of section 3 and legislative options for promoting timely production from Federal coal leases. This report draws on information and analyses from OTA's past work on coal leasing including the 1981 report, *An Assessment of Development and Production Potential of Federal Coal Leases*, and the OTA technical memorandum, *Patterns and Trends in Federal Coal Lease Ownership 1950-80*.

Project Director: Karen Larsen 226-2212.

Published: March 1986.

Requested by: House Committee on Interior and Insular Affairs

High-Technology Ceramics and Polymer Composites (R)

High-technology ceramics and composites
Manufacturing productivity

Development and use of advanced materials such as high performance ceramics and polymer composites promise dramatic changes in many aspects of our economy. The unique properties and design features of these materials provide the opportunity for greatly increased performance in many products in use today, enhanced manufacturing productivity, and new types of products. Composites used as structural members in aircraft and ceramics in machine tool bits already have demonstrated some of these large performance gains. The promise of these materials has caused other nations to embark on major development programs. This Nation's ability to maintain long-term economic growth and remain competitive will depend to a large extent on how well we take advantage of the opportunities presented by these materials. To do so, however, requires that many technical problems and nontechnical barriers be overcome.

This assessment will better define the many opportunities for high-technology ceramics and polymer composites over the next 15 to 25 years. It will determine the principal technical and related problems that need to be overcome if timely expansion of the commercial use of these materials is to take place. Finally, the study will analyze the broad implications of these high-technology materials to future U.S. economic growth and competitiveness.

Project Director: Greg Eyring 226-2151.

Estimated publication date: Summer 1987. Interim publication: "New Structural Materials Technologies: Opportunities for the Use of Advanced Ceramics," (TM), published September 1986.

Requested by: Senate Committee on Commerce, Science, and Transportation, and its Subcommittee on Science, Technology, and Space
House Committee on Science and Technology, and its Subcommittee on Transportation, Aviation, and Materials

Technologies for Prehistoric and Historic Preservation (R)

Historic heritage
Cultural resources
Preservation

In recognition of the importance of preserving our prehistoric and historic heritage, Congress over the last 80 years has enacted a variety of laws to protect and preserve U.S. cultural resources. This assessment provides an overview of technologies for cultural resources management. It: 1) identifies and discusses the most effective current technologies for prehistoric and historic preservation; 2) evaluates the most promising new technologies that could be applied to the problem; and 3) suggests areas for further research and development. The assessment also discusses the costs of the technologies and examines any nontechnical constraints on their use.

The assessment focuses on technologies for: 1) locating, identifying, surveying, and evaluating historic structures and sites and their contents, including archeological sites; 2) preserving buildings, structures, and landscapes; and 3) measuring the effect of changes in the environment on historic structures, artifacts, sites, and landscapes. The report does not discuss the preservation of paintings, books, and other artifacts, except insofar as technologies used in their preservation are

applicable to structures and sites. To the extent pertinent to historic preservation, the study also considers technologies for storing, sharing, and retrieving historic preservation information.

Project Director: Ray Williamson 226-2209.

Published: September 1986. Summary available.

Requested by: House Committee on Interior and Insular Affairs.

Technological Risks and Opportunities for Future U.S. Energy Supply and Demand (R)

Energy supply/demand
Energy outlook
Domestic oil production
Energy conservation
Oil and gas resources

Congress is now being presented with a series of energy demand and supply forecasts that are radically different from those of just a few years ago. A common theme includes greatly moderated oil prices into the early 1990s followed by a possible return to OPEC dominance of oil markets, rising oil prices, and greatly expanded U.S. oil imports by the late 1990s. This study will evaluate current views of the U.S. future energy outlook, identify key technical uncertainties and risks that affect the validity of these views, and identify and evaluate energy policy options for dealing with these uncertainties and risks.

The first phase of the study will evaluate the implications for U.S. energy policy of volatile oil prices, emphasizing the effects of low prices on domestic oil production, e.g., plugging of stripper wells and loss of production from tertiary and some secondary recovery operations in the shorter term, loss of production and reserves due to lower drilling rates, reduced R&D expenditures, and so forth in the longer term. In the second phase, aimed at overall U.S. energy supply and demand, OTA will first examine historic changes in U.S. energy supply and demand and the ability of previous forecasts to anticipate these changes. The study will describe current forecasts for the next 15 to 25 years and identify their underlying assumptions. The study will then identify and evaluate the primary sources of technical uncertainties in the forecasts. The sources of technical uncertainty include: economic growth rates and patterns; new energy supply, conservation, and end use technologies; geologic uncertainties about available oil and gas resources; consumer reactions to lower energy prices, and other aspects of public and industry behavior; and methodological problems in forecasting. Finally, the study will identify and evaluate policy options that would add flexibility to the energy system, i.e., to increase the system's ability to adapt to the range of futures consistent with these uncertainties.

Project Director: Steven Plotkin 226-2110.

Estimated publication date: Fall 1987. Interim publication: "Impacts on Domestic Productions" (SR)

Requested by: House Committee on Energy and Commerce, and its Subcommittee on Fossil and Synthetic Fuels
House Committee on Government Operations

Industry, Technology, & Employment (226-2269)

Strategic Materials: Technologies To Reduce U.S. Import Vulnerability (R)

Strategic materials
Minerals and materials
Foreign economic relations

The United States imports well over $1 billion worth of chromium, cobalt, manganese, and platinum group metals annually. Many of the uses of these metals are essential to the industrial economy and the national defense. The United States imports virtually all of its requirements for these metals; their production is highly concentrated in two regions of the world: the Soviet Union and southern Africa. The potential for interruption of supplies from these sources has heightened congressional interest in alternatives to continued import dependence.

This study assesses the technical alternatives to continued reliance on southern Africa and the U.S.S.R. for strategic metals. It identifies promising opportunities for domestic and diversified foreign production and for conservation and substitution for each metal. The assessment reviews technical, economic, and institutional barriers to the implementation of the alternatives and analyzes governmental options to overcome those barriers.

Key Contact: Audrey Buyrn 226-2269.

Published: May 1985. Summary available.

Requested by: Senate Committee on Commerce, Science, and Transportation, and its Subcommittee on Science, Technology, and Space
House Committee on Science and Technology, and the Subcommittee on Science, Research, and Technology, and the Subcommittee on Transportation, Aviation, and Materials

Superfund Strategy (R)

Hazardous waste management
Toxic substances pollution
Landfills

Mismanagement of hazardous wastes—both past and present—threatens human health and the environment and is expensive for our society. A start has been made in developing cleanup technologies for uncontrolled sites and in averting problems by effective management of new hazardous wastes. Nevertheless, existing technologies are inadequate for some cleanup goals; current economic commitments cannot permanently solve such a large problem; more and more uncontrolled waste sites may need attention, perhaps even some already cleaned up; and institutional responses to known problems have often been called slow. The previous OTA study (*Technologies and Management Strategies for Hazardous Waste Control*) completed in March 1983 and the OTA case study on Love Canal completed in June 1983 addressed these issues in a preliminary way.

This assessment: 1) examines future Superfund needs and how permanent cleanups can be accomplished in a cost-effective manner for diverse types of sites, 2) describes the interactions among many components of the complex Superfund system, and 3) analyzes the consequences of pursuing different strategies for implementing the program. The study brings together a great deal of information on what can be learned from the initial Superfund program in order to improve it. In particular, it focuses on the choice between continuing and improving

the current program and adopting a new strategy on the basis of better information. Such a new strategy has been defined and analyzed by OTA in considerable detail to provide Congress with an understanding of critical policy trade-offs.

Project Director: Joel Hirschhorn 226-2089.

Published: April 1985. Summary available.

Requested by: House Committee on Science and Technology, and its Subcommittee on Natural Resources, Agricultural Research, and Environment
House Committee on Energy and Commerce, and its Subcommittee on Commerce, Transportation, and Tourism

Serious Reduction of Hazardous Waste (R)

Industrial hazardous waste
Industrial processes
Environmental risks
Waste management and reduction
International competition

Americans are very concerned about hazardous waste. Opinion polls consistently show that the public worries more about hazardous waste than about any other environmental issue. The public is constantly reminded of the loss of drinking water supplies from toxic waste contamination, the growing number of hazardous waste sites that must be cleaned up at great expense and with great difficulty, and the need to stop using land disposal of untreated wastes that remain harmful indefinitely.

OTA's first report on hazardous waste in 1983, *Technologies and Management Strategies for Hazardous Waste Control*, was used by Congress in its 1984 amendments to the Resource Conservation and Recovery Act. In 1985 OTA's second hazardous waste report, *Superfund Strategy*, informed the public and assisted Congress in its deliberations on reauthorizing the Superfund program. Now Congress is turning its attention to preventing hazardous waste problems by cutting down on the generation of hazardous waste at its source through innovative engineering and management. However, although there are many environmental and economic benefits to waste reduction, over 99 percent of Federal and State environmental spending is devoted to controlling pollution after waste is generated. Thus, even though everyone agrees in a philosophical sense that waste reduction is good, there is confusion about definitions and methods and, consequently, about what is feasible. *Serious Reduction of Hazardous Waste* examines what is meant by hazardous waste, waste reduction, and even waste reduction technology. The report explores the meaning and consequences of giving primacy to waste reduction over waste management, and puts waste reduction squarely into the context of industrial production and efficiency, recognizing the current constraints of the American economy. The range of policy options examined is intended to assist what surely will be an extensive policy debate—similar in extent and importance to the energy efficiency debates of the past 15 years.

Project Director: Joel Hirschorn 226-2089

Published: September 1986. Summary available.

Requested by: Senate Committee on Labor and Human Resources
House Committee on Small Business
House Committee on Energy and Commerce
House Committee on Science and Technology

Technologies and Management Strategies for Hazardous Waste Control (R)

Hazardous waste disposal
Waste products

Uncontrolled and careless disposal of industrial waste became a national concern in the mid and late 1970s. It became evident at many waste sites that mismanagement and indiscriminate dumping of waste were causing harmful substances to be released into the land, water, and air. It also became increasingly clear that even well-intentioned and currently accepted waste management practices, particularly the use of landfills and other means of land disposal, might still constitute substantial threats through the slow leakage of waste constituents or leachate through the soil and into groundwater, which is a source of drinking water for many communities.

This report focuses on the technological options for managing hazardous waste at operating facilities and the technical adequacy of the Federal regulatory program. It identifies four policy options—beyond maintaining the current Federal program—which could form the basis for a comprehensive approach to protecting human health and the environment from the dangers posed by mismanagement of hazardous waste. One near-term option addresses how to improve the technical effectiveness of the current regulatory structure. The other near-term option provides a nonregulatory or market approach. Both options are compatible with the two longer term options, one of which deals with introducing waste and facility classification into the regulatory structure, and the other of which focuses on greater integration of Federal programs, agencies, and statutes concerned with hazardous waste.

Project Director: Joel Hirschhorn 226-2089.

Published: March 1983. Interim publications:
"Habitability of the Love Canal Area" (TM), published June 1983;
"Nonnuclear Industrial Wastes: Classifying for Hazards Management" (TM), published November 1981.

Requested by: House Committee on Energy and Commerce

Technology and Structural Unemployment: Reemploying Displaced Adults (R)

Unemployment
Retraining
Trade

The problems of displaced adults have received increasing attention in the 1980s, as social, technological, and economic changes have changed the lifestyles of millions of Americans. Displaced adults are workers who have lost jobs through no fault of their own, or homemakers who have lost their major source of financial support. Worker displacement will continue to be an important issue for the remainder of the decade and beyond, as the U.S. economy adapts to rapid changes in international competition, trade, and technology. While increasing automation and other industry adjustments to new competitive forces benefit the Nation as a whole, they do mean that millions of workers are displaced.

This report concentrates on the problems of displaced blue-collar and nonprofessional white-collar workers. These workers are likely to face extended periods of unemployment, loss of health insurance and retirement benefits, and reemployment in a new job with lower pay. For

many semiskilled blue-collar workers the best route back to a good job is retraining, although even with retraining, initial wages are often lower than on the old jobs. Most displaced workers can benefit substantially from other reemployment services, such as job search assistance, counseling, and job development. Relocation assistance is appropriate for some. This report gives an overview of Federal programs that provide such services, and evaluates the extent to which both private and public programs are meeting the needs of displaced workers. It also includes an assessment of the extent to which adult educational systems and new educational technologies can help displaced workers and homemakers prepare for new jobs. In many cases, this preparation involves basic education, an area where technologies such as computer-aided instruction and interactive videodisks are especially promising.

Project Director: Julie Gorte 226-2205.

Published: February 1986. Summary available.

Requested by: Senate Committee on Finance, and the Subcommittee on Economic Growth, Employment, and Revenue Sharing
Senate Committee on Labor and Human Resources, and the Subcommittee on Employment and Productivity
House Committee on Small Business, and the Subcommittee on General Oversight and the Economy

Plant Closing: Advance Notice and Rapid Response (SR)

Mass layoffs
Displaced workers

Plant closings and mass layoffs are a continuing feature of the American economy. Changing conditions of competition and a rapidly growing field of competitors mean that some companies will go out of business or cut back production, or install labor-saving technologies, and workers will be displaced. These adjustments go on during all parts of the business cycle, during recovery and economic growth as well as recession. In the expansion years of 1983 and 1984, over a million workers in larger establishments with more than 100 employees lost their jobs because of business closure or permanent mass layoff.

It has been found that larger establishments provide some kind of notice to at least some of their displaced workers, but the amount of notice individuals receive is short. Advance layoff notices range anywhere from 2 days to 2 weeks. Except in unusual circumstances, notice periods this brief do not allow enough time to prepare an effective program of adjustment assistance to the displaced workers.

This special report is based partly on a workshop cosponsored by GAO that explored benefits and costs of advance notice, and partly on additional research by both OTA and GAO, including an extensive survey and several case studies.

Project Director: Julie Gorte 226-2205

Published: September 1986

Requested by: Congressman William Clay
Congressman Silvio Conte
Congressman William Ford

Displaced Homemakers: Programs and Policy (R)

Unemployed homemakers
Training
Vocational Education Act

Displaced homemakers are a large, often overlooked group of people, mostly women, who have lost their primary source of income. Many of these people have not worked in the commercial sense for many years, though they often have skills developed in homemaking, past work experience, or volunteer activities. However, the combination of little recent experience in paid work, little or no source of income and, often, falling self-esteem gives them significant handicaps in finding new jobs to support themselves and their families. In the Vocational Education Act of 1984, Congress added significantly to the funds available to serve displaced homemakers.

This report addresses issues that may arise as new programs for displaced homemakers are developed with the increased funds made available by the 1984 act. For example, even with the augmented Vocational Education programs, will adequate funding be directed specifically to displaced homemakers? Can displaced homemakers, who often have no source of income support, afford training? Do the programs that serve displaced homemakers meet their special needs (for example, job readiness counseling, peer group support, and training for nontraditional jobs)? The report considers these questions and describes and evaluates displaced homemaker programs and projects funded under the Job Training and Partnership Act and the Vocational Education Act.

Key contact: Katherine Gillman 226-2199.

Published: October 1985.

Requested by: Senate Committee on Labor and Human Resources

Technology, Innovation, and U.S. Trade (R)

International trade
Manufacturing
Commercialized technologies
Industrial development
Trade policies
Employment

The international diffusion of technology has meant that competition from a growing number of countries, in a widening array of products, has cut into the market share of U.S. manufacturers. One result is an unprecedentedly large trade deficit, expected to top $160 billion in 1986. Many factors account for the edge that foreign manufacturers have won in a growing number of products. The rapid spread of technology—in many cases, technology developed in the United States—is partly a result of: 1) U.S. overseas investments and cooperative agreements, 2) the emphasis placed on the development of commercial technologies by foreign governments and businesses, and 3) the reluctance of some U.S. manufacturers to invest in new product development and commercialization. Other factors contribute to the successful penetration of U.S. markets. They include foreign industrial policies, differences in capital costs and availability, and the emphasis foreign manufacturers place on aggressive marketing and distribution, domestic manufacturing, long-term gains rather than short-term financial performance, and the effective use of human capital. High American wages, while clearly a factor, reflect our high standard of living, which few would be willing to compromise in order to compete with offshore production.

The study will examine how changes in the competitiveness of U.S. manufacturing industries affect the ability of the U.S. economy to create new jobs in various sectors. The study will also assess how technology, coupled with strategic responses by U.S. firms could reverse the erosion of our market shares. Possible policy responses of the U.S. government will be identified, with particular emphasis on policies that could stimulate U.S. producers to invest in technologies for development and commercialization of new products, policies that could aid industrial and technological development in industrializing nations without unduly harming U.S. manufacturers, and trade policies that go beyond traditional "free trade or protection" arguments.

Project Director: Julie Gorte 226-2205.

Estimated publication date: Winter 1988-89.

Requested by: Senate Committee on Finance
Senate Committee on Banking, Housing, and Urban Affairs
House Committee on Banking, Finance, and Urban Affairs

International Competition in the Service Industries (R)

Employment
Technology transfer

The services, producers of intangibles or invisibles, have become mainstays of the U.S. economy, both in terms of domestic employment and foreign sales. Many are driven by new technologies. The U.S. balance of payments position depends heavily on income from foreign sales of intangibles to counterbalance, if only in part, merchandise deficits. Exports to technology-intensive manufactures—commercial aircraft, power generating equipment, electronic systems—are frequently tied to training and maintenance contracts. New developments in many of the service industries stem directly from technical advances. Increasingly, the Western European nations and Japan offer strong competition in international markets for technologically based services.

The analytical approach in this assessment will be based on that developed in past OTA studies of competitiveness: four service industries have been selected for detailed analysis based on business strategies as affected by technological developments, industrial structure, and government policies.

Project Director: John Alic 226-2012.

Estimated publication date: Spring 1987.

Requested by: Senate Committee on Foreign Relations, and its Subcommittee on International Economic Policy, Oceans, and Environment
Senate Committee on Governmental Affairs
House Committee on Small Business, and its Subcommittee on General Oversight and Economy
House Committee on Banking, Finance, and Urban Affairs, Subcommittee on Economic Stabilization

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Trade in Services: Exports and Foreign Revenues (SR)

International services trade
U.S. balance of payments

This special report examines alternative methods of defining and measuring international services trade—distinguishing, in particular, between direct exports (or imports) and the revenues of foreign affiliates of U.S. companies. The report estimates the level of U.S. international trade in services over the period 1982-84, compares these estimates with the official figures reported in the U.S. balance of payments, and outlines specific options for improving the services database.

Project Director: John Alic 226-2012.

Published: September 1986. Summary available.

Requested by: Senate Committee on Governmental Affairs
Senate Committee on Foreign Relations
House Committee on Small Business

International Security & Commerce (226-2026)

Space Stations and the Law: Selected Legal Issues (BP)

Space stations
Tort law
Intellectual property law
Criminal law

Multinational space station activities will raise fundamental legal issues. The laws we take for granted on Earth—e.g., those that regulate commerce, property, criminal activity, and personal interactions—may not be available in space or may conflict with similar laws held by other nations. This background paper analyzes some of the legal consequences of developing and operating an international space station. It describes the different ways that an international space station might be owned and operated and explains how each could affect the rights and responsibilities of the U.S. Government and its citizens. The background paper gives special attention to the application of jurisdiction, tort law, intellectual property law, and criminal law to nations and to individuals living and working in space. In addition to these specific legal issues, the paper also examines the role of politics and technology in legal decisionmaking, the usefulness of air law and maritime law analogies, and the conflict between State and Federal law and jurisdiction in the United States.

Project Director: Richard DalBello 226-2059.

Published: September 1986.

Requested by: Senate Committee on Commerce, Science, and Transportation

International Cooperation and Competition in Civilian Space Activities (R)

Space activities
Technology transfer
Telecommunications
Remote sensing
Scientific cooperation (international)
International competition

Over the last decade, Europe and Japan have developed substantial space programs and are now building space systems that compete commercially with U.S. space technology. Although they have markedly increased their ability to compete with the United States, at the same time these countries have also become more capable partners for cooperative ventures in space science and space applications. This report examines the consequences of these developments, both for the U.S. space program and for the private sector space systems. It explores the status of space transportation, satellite telecommunications, remote sensing from space, materials processing in space, and space science, and analyzes a range of cooperative and competitive policy options for addressing the issues raised in these sectors. Further, the report explores the role of the developing countries in global space activities and develops options for enhancing their use of space technology.

Project Director: Ray Williamson 226-2209.

Published: July 1985. Summary available. Interim publications:
"Remote Sensing and the Private Sector: Issues for Discussion" (TM), published March 1984;
"UNISPACE '82: A Context for International Cooperation and Competition" (TM), published March 1983.

Requested by: House Committee on Science and Technology, and its Subcommittee on Space, Science, and Applications
Joint Economic Committee

Technology Transfer to the Middle East (R)

Technology transfer
Middle East
Developing countries
Petrochemicals
Nuclear power
Telecommunications
Aircraft maintenance

During the last decade, the Middle East has been the world's fastest growing market, one which West European, Asian, and Communist as well as U.S. enterprises have all sought to penetrate. The oil-rich nations have purchased the most advanced equipment and technology, both civilian and military. Technology transfers on such a large scale may have important implications for both the recipient and supplier nations. This study assesses the commercial and strategic ramifications of transfers of advanced Western technologies (in sectors such as operation and maintenance of aircraft, petrochemical production facilities, nuclear powerplants, communications, and service systems) in order to provide a foundation for U.S. policy development.

The study assesses past experience with technology transfers to the Middle East, investigates the capability of these nations to effectively absorb advanced Western technology, evaluates the likelihood of continued and expanding transfers in the years ahead, and discusses the implications for American foreign and international economic policy.

Project Director: Martha Harris 226-2016.

Published: September 1984. Summary available.

Requested by: House Committee on Science and Technology, and its Subcommittee on Investigations and Oversight
Senate Committee on Banking, Housing, and Urban Affairs
Senate Committee on Government Affairs, Subcommittee on Energy, Nuclear Proliferation, Government Processes

Technology Transfer to China (R)

Technology transfer
Telecommunications
Computers
China
International competition
Export controls

The People's Republic of China (PRC) is introducing major changes as it rapidly modernizes its economic system and seeks improved global relationships. Imports of technology and scientific expertise and the encouragement of foreign investment are key elements. This presents economic and strategic opportunities and risks for the United States. China could become a major market for U.S. exports, and technology transfer could enhance economic growth for both countries. Technology transfer could also be a major factor in improving relations and strengthening China's role in Asia. However, if relations deteriorate between the United States and the PRC, we may regret having provided technology that would strengthen their military. Another concern is that China may expand commercially to become a competitor in world markets. This assessment will examine the role of imported science and technology in the plans of the PRC, the technology the United States and other nations can supply, the impacts of policy on these transfers, and the security and commercial risks involved.

Project Director: Alan Crane 226-2105.

Estimated publication date: Spring 1987. Interim publication:
"Energy Technology Transfers to China" (TM), published September 1985.

Requested by: Senate Committee on Banking, Housing, and Urban Affairs
House Committee on Energy and Commerce, and the Special Subcommittee on U.S.-Pacific Rim Trade

Seismic Verification of Nuclear Test Limitation Treaties (R)

Nuclear weapons tests
Nuclear explosions
Seismology

For nearly 30 years, a ban on the testing of nuclear weapons has been a major objective of arms control, but it has remained unattainable due in large part to the technical question of whether such a treaty could be adequately verified. This question has become particularly pronounced in view of the administration's finding that the Soviet Union is likely to have violated the Threshold Test Ban Treaty by exceeding the 150 kiloton testing limit. The specific concern is that seismic methods used to verify test bans may not be able to distinguish between earthquakes and certain relatively small nuclear explosions. In addition, the monitoring network could perhaps be evaded by muffling explosions in large underground cavities, or by masking explosions during naturally occurring earthquakes. Recently, there have been a number of technological achievements in the field of seismology and assertions have been made that they will significantly improve our capabilities to monitor underground nuclear explosions. Some of these new discoveries may also provide effective methods for countering the possible evasion ploys. This study will examine the impact that recent developments in seismology have had on the United States' capability to seismically verify a treaty with the Soviet Union that would either ban or limit the testing of nuclear weapons.

Project Director: Gregory E. vanderVink.

Estimated publication date: Fall 1987.

Requested by: Senate Select Committee on Intelligence
House Committee on Foreign Affairs
House Permanent Select Committee on Intelligence

Strategic Defense Initiative: Technology, Survivability, and Software (R)

Ballistic missile defense
Computer software

The project will build on the previous report by carrying out three major tasks. One task will be to update the 1985 OTA report on "Ballistic Missile Defense Technology" with respect to the technologies currently being researched under the Strategic Defense Initiative (SDI). The work of the earlier report will not be repeated, but rather special attention will be given to filling in gaps in that report and to reporting on technical progress made in the intervening 2 years. A second task will be to examine the best currently available information on the prospects for functional survival against preemptive attack of alternative ballistic missile defense system architectures currently being studied under SDI. A third task will be to analyze the issues involved in the question of whether it is feasible to develop reliable software to perform the battle management tasks required by such system architectures.

Project Director: Thomas Karas 226-2014.

Estimated publication date: Summer 1987.

Requested by: Mandated study.

Ballistic Missile Defense Technologies
Report I: Ballistic Missile Defense Technologies (R)
Report II: Anti-Satellite Weapons, Countermeasures, and Arms Control (R)

Ballistic missile defense
Anti-satellite weapons
Arms control

The Administrations's "Strategic Defense Initiative" (SDI) is an accelerated program of research and technology development for ballistic missile defense (BMD) systems, with the stated ultimate goal of "eliminating the threat posed by nuclear ballistic missiles. *Ballistic Missile Defense Technologies* examines the potential roles of various levels of BMD deployments in U.S. national defense strategy and the potential implications of BMD for strategic stability and arms control. The report explains and assesses the status of the new technologies applicable to BMD. Finally, it describes the character and implications of a range of alternative research programs Congress may wish to consider.

The topics of *Anti-Satellite Weapons, Countermeasures, and Arms Control* have important implications for research on and deployment of space-based BMD systems. It examines various current and potential anti-satellite weapons and countermeasures and discusses a range of potential arms control regimes.

Project Director: Tom Karas 226-2014.

Published: September 1985. Summaries available.

Requested by: House Committee on Armed Services
Senate Committee on Foreign Relations
House Committee on Foreign Affairs

The Effects of Nuclear War (R)

Atomic warfare
War casualties
Civil defense

Nuclear war is not a comfortable subject. Throughout all the variations, possibilities, and uncertainties that this study describes, one theme is constant—a nuclear war would be a catastrophe. A militarily plausible nuclear attack, even limited, could be expected to kill people and to inflict economic damage on a scale unprecedented in American experience; a large-scale nuclear exchange would be a calamity unprecedented in human history. The mind recoils from the effort to foresee the details of such a calamity, and from the careful explanation of the unavoidable uncertainties as to whether people would die from blast damage, from fallout radiation, or from starvation. But the fact remains that nuclear war is possible, and the possibility of nuclear war has formed part of the foundation of international politics, and of U.S. policy, ever since 1945.

This study examines what is known, and what is not known, about the likely consequences if efforts to deter and avoid nuclear war should fail. Those who deal with policy issues regarding nuclear weapons should know what such weapons can do, and the extent of the uncertainties about what such weapons might do.

Key Contact: Peter Sharfman 226-2020.

Published: May 1979.

Requested by: Senate Committee on Foreign Relations

International Competitiveness in Electronics (R)

Electronic industry
Computer industry
International competition

There is a growing concern that key U.S. industries are declining in their international competitive positions. The electronics industry is particularly significant because it occupies a strategic position as a technological driving force for other industries that use products like semiconductors and computers. The report assesses three sectors of this industry: consumer electronics (where the United States has suffered heavily from Japanese competition); semiconductors (where a strong U.S. position is under challenge); and computers (where the United States still appears to lead the world).

It focuses on those major contributors to the competitiveness of the electronics industry that could most readily be affected by U.S. Government policy. The study compares the United States, Japan, and (to a lesser extent) Western Europe with respect to the following major factors: 1) commercialization of research, development, and design; 2) manufacturing techniques and resources; 3) finance, including both private and public sources of funds; 4) human resources, both quantity and quality; and 5) governmental/industrial policies.

Project Director: John Alic 226-2012.

Published: November 1983. Summary available.

Requested by: Senate Committee on Commerce, Science, and Transportation
Joint Economic Committtee
House Committee on Ways and Means, Subcommittee on Trade

Alternatives for Improving NATO's Defensive Response (R)

Conventional defense
NATO

Prominent among recent initiatives for improving NATO's conventional defense are the exploitation of emerging technologies—especially "smart" munitions—and the follow-on forces attack (FOFA) concept for interdicting Warsaw Pact forces that have not yet joined the offensive. The United States presently spends hundreds of millions of dollars annually for research on weapons and support systems for interdiction; eventual procurement could total hundreds of billions.

This OTA assessment will develop a comprehensive appraisal of the technical, military, and political opportunities and risks of using various technologies to implement the FOFA concept. It will assess current and advanced conventional weapons. The assessment will examine other issues such as aircraft and missile platforms and target acquisition, and identify and assess unsolved technical problems. Soviet doctrine will be reviewed to assess possible Soviet responses and the military value of alternative NATO interdiction technologies. Finally, the project will identify and assess a range of possible U.S. policy options for implementing FOFA.

Project Director: Alan Shaw 226-2018.

Estimated publication date: Winter 1986-87.

Requested by: House Committee on Foreign Affairs
House Committee on Armed Services
Senate Committee on Armed Services

Technologies for NATO's Follow-On Forces Attack Concept (SR)

This study reviewed both the operational and technical developments of NATO's Follow-on forces attack concept. The study also suggests some guidelines to follow in making procurement decisions.

Project Director: Allan Shaw 226-2018.

Published: July 1986.

Requested by: House Committee on Foreign Affairs
House Committee on Armed Services
Senate Committee on Armed Services

Technology & Economic Transition—A Special Project (226-3960)

Technology and the American Economic Transition (R)

Employment
Economic growth

New technologies, rapid shifts in the price of energy and other critical commodities, sharp increases in trade (resulting in large part from the successful postwar reconstruction of the European and Japanese economies), and an unprecedented increase in the number of young people and women in the work force may lead to fundamental changes in the structure of the U.S. economy. We have already witnessed rapid growth in new fields (particularly those involving the processing and transmission of information) while many of the stalwarts of the American economy have not performed as well as expected. Declines in manufacturing employment have accompanied rapid growth in business service employment. Fluctuations in productivity have become increasingly difficult to explain. The analysis conducted for this project will describe how effects of technology can be disentangled from the other forces acting to change the economy. Instead of attempting to forecast the changes that may occur, it will provide a description of the choices that will be available and the potential consequences of decisions that must be made. In particular, it will examine national policy decisions that may be needed to exploit the opportunities technology can offer and protect the country from potential adverse consequences.

Project Director: Henry Kelly 226-3960

Estimated publication date: Winter 1986-87; Interim publications:
- "Technology and the Future of the U.S. Construction Industry," published May 1986 (available through AIA Press)
- "A Review of U.S. Competitiveness in Agricultural Trade" (TM), published October 1986
- "Downtown Comes to the Suburbs: The Decentralization of Office Buildings in Metropolitan America" (SR); Project Director: David Dowall 226-3960
- "Food Irradiation" (SR), published August 1986
- "Food in the American Economy" (SR); Project Director: Mark Bello 226-3960
- "Special Report on Technology and Education" (SR); Project Director: Henry Kelly 226-3960
- "Technology and Education: The Views of 20 Experts" (SR); Project Director: Henry Kelly 226-3960
- "Transportation and Structural Change in the U.S. Economy" (SR); Project Director: Elizabeth Deakin 226-3960
- "American Health and the American Economy" (SR); Project Director: Zeda Rosenberg 226-3968
- "Communications and Information Processing in Transition" (SR); Project Director: Donald Dunn 226-3960
- "Recreation and Leisure" (TM); Project Director: Steven Ackerman 226-3960
- "Manufacturing Matters: The Myth of the Post-Industrial Economy" (SR); Project Director: Steven Cohn 226-3960
- "Textiles and Apparel" (SR); Project Director: Ruth Rutenberg 226-3960

Requested by: Senate Committee on Commerce, Science, and Transportation, and its Subcommittee on Business, Trade, and Tourism
Senate Committee on the Budget
House Committee on Energy and Commerce
House Committee on Post Office and Civil Service
House Committee on Science and Technology
House Committee on Education and Labor
House Committee on the Judiciary
House Committee on Public Works and Transportation
House Committee on Banking, Finance, and Urban Affairs

Technology, Trade, and the U.S. Residential Construction Industry (SR)

Housing industry
Construction
Energy costs
International trade

New technologies and the expansion of international trade, have affected both building techniques and the nature of the home itself. Factory-based production has the potential to improve housing quality, reduce maintenance and energy costs, improve the way houses are tailored to individual needs, and improve the quality of construction jobs. This potential may well not be captured.

The report explains how wildly varying demand, an antiquated regulatory system, and a highly fragmented industry have created an industry that does very little research and avoids investments in human or physical capital.

Project Director: Henry Kelly 226-3960.

Published: September 1986.

Requested by: House Committee on Banking, Finance, and Urban Affairs

Biological Applications (226-2090)

Technology and Aging in America (R)

This study focuses on the functional status of the elderly and the ways in which technology can assist them to maintain their independence and enhance their quality of life. Medical and health care technologies have led to increased longevity, which has been accompanied by rising prevalence of chronic diseases that impair functional ability. Therefore, this assessment focuses on technology and changes in: 1) health status, 2) health services, 3) the living environment, and 4) the workplace.

The report discusses the impact of five chronic conditions on the lives of those afflicted, potential health improvements from behaviors that may delay onset of chronic diseases, the need for increased biomedical research, and how telecommunications can foster self-health care. It also reviews the importance of medication for management of chronic impairments, the need for a coordinated approach to long-term care, appropriately developed supportive services, and improved technologies to assess health and functional status.

The report describes Federal programs that subsidize rental housing for the elderly and also new design standards that promote safety and improve the elderly's ability to be self-sufficient. The study also evaluates the impact of changes in workplace technology. Job security may be weakened in some industries, while in others technology can enhance job performance, safety, and security for older workers. Telecommunications are making the "electronic cottage" a reality and retraining of older workers would encourage continued employment or provide new job possibilities.

Aged
Technology and social problems
Functional capabilities
Chronic conditions
Living environment
Workplace
Long-term care
Telecommunications
Health promotion
Drugs/medication

Key Contact: Gretchen Kolsrud 226-2090.

Published: June 1985. Summary available. Follow-on publication: "Technologies for Managing Urinary Incontinence" (CS), published July 1985.

Requested by: Senate Special Committee on Aging
House Select Committee on Aging
House Committee on Education and Labor

Hearing Impairment and Elderly People (BP)

About one-fourth of people over 65 and up to 40 percent of those over 75 have hearing impairments that interfere with understanding normal speech. Even these numbers may underestimate the prevalence of this problem because hearing impairment in the elderly is often undetected. Most hearing impairments of the elderly cannot be corrected with available medical or surgical treatments. Thus, the use of technologies that compensate for hearing impairments is often the most effective treatment. This OTA background paper describes the most common types and causes of hearing impairment in the elderly and reviews technologies such as hearing aids, assistive listening devices, signaling and telecommunication devices, and environmental design technologies that can be used to compensate for hearing loss.

Aged/elderly
Hearing impairment

Elderly people and their families are generally unaware of many of these technologies, and little information about their effectiveness is available to consumers. In addition, with the exception of hearing aids, the existing services delivery system does not promote access to available technologies. This background paper emphasizes the need for more public information about technologies that compensate for hearing loss and improved service delivery systems that are adapted to the characteristics of the elderly.

Study Director: Katie Maslow 226-2090.

Published: May 1986.

Requested by: Senate Special Committee on Aging
House Select Committee on Aging

Classification Systems for Critical Care for Elderly Patients (BP)

Aged/elderly
Intensive care units
Patient classification systems
Surrogate decisionmaking

Increasingly sophisticated medical technologies allow practitioners to provide life-sustaining care, often for lengthy periods of time and at high cost, with little prospect of curing the underlying disease process and limited ability to predict the outcome of treatment. Lack of accurate prognostic information has been a major obstacle to informed decisionmaking about the appropriate use of many life-sustaining technologies, particularly in the intensive care unit. Recently, however, a variety of classification systems designed to provide objective criteria on which to base treatment decisions have been developed, tested, and promulgated. The background paper shall provide a guide to the problems and procedures for deriving appropriate critical care case-mix measures for use by hospital administrators, practitioners, health care policymakers, and researchers and shall reflect these different perspectives. A focus of the analysis will be on decisions for resource allocation within the hospital and across hospitals. The paper will be published in conjunction with the OTA assessment of "Life-Sustaining Technologies and the Elderly."

The paper describes the "state of the art" in such patient classification systems. The paper provides: 1) an overview of the resource allocation problem in critical care and a discussion of efficiency and equity issues in resource allocation for critical care (e.g., cost containment, legal liability issues, establishment of priorities for care, management of limited resources); 2) a conceptual framework for evaluating patient classification systems in the critical care setting, including a discussion of the usefulness of using a case mix measure for prognosis (i.e., individual treatment decisions); 3) a description of existing critical care classification systems, including measures developed especially for use in the ICU and general purpose hospital case mix measures; 4) a comparative evaluation of critical care classification systems; 5) a discussion of the selection of a critical care classification system for payment purposes under Medicare; and 6) a section on conclusions, policy implications, and issues for future research.

Project Director: Judy Wagner 226-2070.

Estimated publication date: Spring 1987.

Requested by: Senate Special Committee on Aging
House Select Committee on Aging

Impacts of Neuroscience (BP)

Neurology
Brain research
Neuroscience
Neurotoxicology
Bioethics
Nervous system

Neuroscience research has led to new treatments for major causes of death in both the developed world (cardiovascular disease and stroke), and developing nations (parasitic diseases), in addition to advancing knowledge about neurological and psychiatric disorders. In the United States, the aging of the population provides one of the strongest incentives for research on the nervous system, because of the burden of illness imposed by several mental and organic brain disorders that become increasingly common with age, such as depression, insomnia, and Alzheimer disease.

One of the most important motives driving neuroscience research is the desire for solutions to the ravages of brain diseases like Alzheimer disease. This background paper focuses on the status of basic neuroscience research, and investigates not only the current status and potential medical applications, but also includes broad social and ethical issues that might arise from such research. This background paper also looks at neurotoxicology. Toxic damage to the nervous system is emerging as an important area for public policies to protect the health of workers and members of the general population. Neurotoxicology is also growing rapidly as a scientific discipline.

Study Director: Robert Cook-Deegan 226-2090.

Published: March 1984.

Requested by: Senate Special Committee on Aging
House Select Committee on Aging
House Committee on Education and Labor

Life-Sustaining Technologies and the Elderly (R)

Aged/elderly
Bioethics
Medical technology
Medical decisionmaking
Death and dying
Patients' rights
Surrogate decisionmaking
Medicare
Geriatrics
Critical/intensive care

Modern medical technologies include numerous devices and procedures with the potential to sustain life in patients who are critically or terminally ill. These technologies are widely available, and many recipients are elderly persons, who vary greatly in physiological and psychological status and in prognosis. There is considerable uncertainty regarding the efficacy of these technologies for individual patients, debate about their impact on "quality of life," and concern about their cost, particularly to Medicare. Thus, "life-sustaining technologies" raise complex legal, ethical, clinical, and financial questions.

OTA's assessment focuses on five selected life-sustaining technologies: cardiopulmonary resuscitation, mechanical ventilation, renal dialysis, nutritional support, and life-sustaining antibiotic therapy. The report describes the use of these technologies with life-threatened elderly patients, presenting available data on utilization and cost in different settings, efficacy, and aspects of treatment and outcomes that distinguish elderly patients from younger ones. Ethical issues and legal questions, particularly those related to patients' rights and surrogate decisionmaking are reviewed. The report also addresses the adequacy of health professions manpower and training for the care of life-threatened elderly persons and reviews likely future development of these technologies.

Project Directors: Claire Maklan and Katie Maslow, 226-2090.

Estimated publication date: Spring 1987.

Requested by: Senate Special Committee on Aging
House Select Committee on Aging

Losing a Million Minds: Confronting the Tragedy of Alzheimer's Disease and Other Dementias (R)

Dementia
Alzheimer disease
Aging/elderly
Medicaid
Long-term care
Biomedical research
Health

Dementia is the major disability necessitating long-term care for older Americans. The social problems caused by dementing conditions have become the focus of political attention in recent years as the prospect of dramatic increases in the number of patients affected and awareness of the severity of the diseases has increased. Grassroots organizations of affected families have also become more prominent. Costs for severe dementia are estimated in the range of $24 to $48 billion in the United States, of which approximately $4.4 billion derives from Federal contributions to Medicaid. The very old population at greatest risk for dementia is projected to increase rapidly over the next decade. Topics covered in the OTA assessment include: research on diseases causing dementia, including Alzheimer's disease; government responses to demand for long-term care; problems in determining eligibility for long-term care programs; legal issues; financing of long-term care; family obligations and burdens; assuring quality long-term care; and social and ethical implications.

Project Director: Robert Cook-Deegan 226-2090.

Estimated publication date: Spring 1987.

Requested by: Senate Committee on Labor and Human Resources
Senate Special Committee on Aging
Senate Committee on Veterans' Affairs
Senate Committee on Finance
House Committee on Energy and Commerce
House Committee on Science and Technology
House Select Committee on Aging

Surrogate Decisionmaking for Elderly Individuals (BP)

Aging/elderly
Dementia
Bioethics
Health
Mental health

Current and projected increases in the number of elderly persons with progressive, irreversible dementias have led to a growing interest and concern over the problems and practices of surrogate decisionmaking. The background paper will be published as part of a joint effort of the "Losing a Million Minds: Confronting the Tragedy of Alzheimer's Disease and other Dementias" and "Life-Sustaining Technologies and the Elderly" assessments.

The paper will address such issues as determinants of mental competence, levels of competence, the process of identifying a surrogate, the transferring of decisionmaking power, ethical dilemmas in surrogate decisionmaking, limitations to surrogate decisionmaking powers, advance directives, conflicts of interest, commitment to nursing homes, and abuse of surrogate powers. The background paper will also analyze appellate court decisions relevant to critical care for the demented elderly in the following ways: the role of the courts in such decisions, and in determining competence and protecting patient autonomy; the right to refuse life-sustaining treatment; and the role of criminal law in cases of critical care for elderly incompetent patients.

Study Director: Teresa Myers 226-2090.

Estimated publication date: Spring 1987.

Requested by: Senate Special Committee on Aging

New Developments in Biotechnology (R)

Patent law
Biotechnology
Genetic engineering

Public attention has recently been focused on the release into the environment of genetically engineered organisms. Questions center on the stability of genetic material inserted into the organisms, on the probability that the inserted genetic material will be transferred to other, non-target organisms, as well as on the effect of genetic material passed from one organism to another. OTA examines these issues and others in the burgeoning field of biotechnology. A series of publications will address the environmental application of genetically altered organisms; ownership of human tissues and cells; commercial development of tests for human genetic diseases; funding of research in biotechnology; patent law applicable and appropriate to biotechnology; and development of socially useful biotechnology products that may not be highly profitable.

Project Director: Gary Ellis 226-2090.

Estimated publication date: Spring 1987. Interim publications:
"Public and Private Funding of Research and Training in Biotechnology" (BP); Study Director: Kathi Hanna 226-2090
"Environmental Applications of Genetically Altered Organisms" (BP); Study Director: Val Giddings 226-2090
"Applications of Biotechnology to Test for Human Genetic Disorders" (BP); Study Director: Tony Holtzman 226-2070
"Ownership of Human Tissues and Cells" (BP); Study Director: Gladys White 226-2090

Requested by: House Committee on Science and Technology
House Committee on Energy and Commerce
Senate Committee on the Budget

Mapping the Human Genome (R)

DNA sequencing
Gene mapping
Biotechnology

Each human cell, except sperm and egg cells, contains 46 chromosomes. The chromosomes contain an estimated 50,000 to 100,000 genes encoded throughout a sequence of some 3 to 3.5 billion DNA base pairs. Technologies to rapidly determine DNA sequences have been developed over the past decade, and have recently been automated. Techniques to identify "landmarks" on each of the human chromosomes are well underway, and the number of such landmarks is roughly doubling each year. These emerging technologies have led to speculation that the Federal Government should mount a special effort, estimated to cost in the range of $3 billion over 5 to 10 years, to generate the entire human DNA sequence. A concurrent debate centers on alternative means of usefully mapping the human genome, not necessarily resulting in a complete DNA sequence. The Japanese are mounting a major gene sequencing project, and the Howard Hughes Medical Institute—with its $5 billion endowment—is heavily invested in gene mapping.

Policy implications arise from several sources. First, the expertise to perform the sequencing resides in several different executive agencies, primarily the Department of Energy and the National Institutes of Health. Funding and coordination would thus be complex. Second, this could be among the first "big science" projects in biology, requiring substantial resources over a sustained period. Third, the technologies to do the sequencing and gene mapping would have significant clinical applications, scientific consequences, and industrial spinoffs for biotech-

nology. Fourth, an international effort to map the human genome would have to contend with conflicts between free exchange of data and technology, on one hand, and proprietary and nationalistic interests on the other.

Project Director: Robert Cook-Deegan 226-2090.

Estimated publication date: Spring 1988.

Requested by: House Committee on Energy and Commerce

Commercial Biotechnology: An International Analysis (R)

Biotechnology
Drug industry
Agricultural innovations
Specialty and commodity chemicals
Bioelectronics
Finance and tax incentives
Intellectual property law
Antitrust law
University/industry relationships
Government research
Public perception
Comparison with U.S. semiconductor industry
Biotechnology firms
Health, safety, environment regulation

Following the first successful directed insertion of foreign DNA in a host micro-organism in 1973, scientific researchers in the United States and other countries began to recognize the potential for directing the cellular machinery to develop new and improved products and processes in a wide diversity of industrial sectors. Potential applications of novel genetic techniques include the production of new drugs, food, and chemicals; the degradation of toxic wastes; and the improvement of agricultural products. Thus, these new techniques could have a major economic impact on industries throughout the world.

This report assesses 10 factors of importance in the competitive position of the United States with respect to Japan and four European countries believed to be the major competitors in the commercial development of "new biotechnology." Although the United States is currently the world leader, continuation of the initial preeminence of American companies in the commercialization of new biotechnology is not assured. The report identifies congressional policy options for improving U.S. competitiveness in new biotechnology.

Key Contact: Gretchen Kolsrud 226-2090.

Published: January 1984.

Requested by: Senate Committee on Commerce, Science, and Transportation, and its Subcommittee on Science, Technology, and Space
Senate Committee on Labor and Human Resources
House Committee on Science and Technology, and its Subcommittee on Science, Research, and Technology, and its Subcommittee on Investigation and Oversight

Impacts of Applied Genetics: Micro-Organisms, Plants, and Animals (R)

Genetic engineering
Plant agriculture
Animal agriculture
Environmental uses
Pharmaceutical industry
Chemical industry
Food industry
Public perception

Genetic technologies will have a broad impact on the future. They may contribute to filling some of the most fundamental needs of mankind—from health care to supplies of food and energy. At the same time, they arouse concerns about their potential effects on the environment and the risks to health involved in basic and applied scientific research and development.

This report describes the problems and potential of applying the new genetic technologies to a range of major industries. It emphasizes the present state of the art because that is what defines the basis for future applications. The report estimates the economic, environmental, and

institutional impacts—where, when, and how some technologies might be applied and what some of the results might be.

Key Contact: Gretchen Kolsrud 226-2090.

Published: April 1981. Summary available.

Requested by: Senate Committee on Human Resources
House Committee on Interstate and Foreign Commerce, Subcommittee on Health and the Environment

Human Gene Therapy (BP)

Genetic engineering
Human genetics
Genetics
Gene therapy
Biotechnology
Bioethics

Interest in human applications of recombinant DNA technology has been expressed by numerous scientific, medical, religious, civic, and government leaders. This background paper focuses on the imminent development of human gene therapy, emphasizing early medical applications. The governmental concerns related to human gene therapy, as for other medical technologies, will include protection of subjects involved in research and clinical treatment, ensuring safety and efficacy of the techniques in specific applications, and public discussion and education.

Human gene therapy, if it is approved for use, will first be performed on patients who have no better prospect for treatment, and who suffer from severe, rapidly fatal diseases caused by defective genes. Treatment will involve inserting copies of the normal gene into cells where the new gene can be used to produce proteins that correct a biochemical defect. Human gene therapy as currently envisioned would thus be applied to treat patients with specific rare genetic disease, and not as the tool of a eugenic social program intended to improve the human gene pool.

Study Director: Robert Cook-Deegan 226-2090.

Published: December 1984.

Requested by: House Committee on Science and Technology, Subcommittee on Investigations and Oversight

Infertility Prevention and Treatment (R)

Infertility services
Drug therapy
Microsurgery
Artificial insemination
In vitro fertilization
Embryo transfer/freezing

With infertility affecting one in six American couples, the demand for infertility services has escalated markedly in recent years. In addition to drug therapy, microsurgery, and artificial insemination, an array of innovative reproductive technologies is now available to help infertile couples. These include in vitro fertilization, embryo transfer, embryo freezing, and gamete intra-fallopian transfer. Worldwide, an average of three babies are born each day via in vitro fertilization. OTA examines technologies to prevent, diagnose, and treat infertility; Federal and State regulation of reproductive technologies; the special reproductive problems of service veterans; and ethical considerations linked to some infertility treatments and reproductive technologies.

Project Director: Gary Ellis 226-2090.

Estimated publication date: Winter 1987-88.

Requested by: Senate Committee on Veterans' Affairs
House Committee on Government Operations, and its Subcommittee on Intergovernmental Relations and Human Resources
Senate Committee on Governmental Affairs

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Reproductive Health Hazards in the Workplace (R)

Health hazards
Reproductive hazards
Sex discrimination
Workers' compensation
Regluation under OSHA and FIFRA
Chemical hazards
Biological hazards
Physical hazards
Radiation
Civil Rights Act

Although the extent to which workplace exposure to chemical, physcial, and biological agents may contribute to reproductive impairment is unknown, the level of reproductive impairment in the population is a significant public health concern. There is an obvious need for elucidating the causes in order to reduce the overall incidence of reproductive impairment. Policy decisions regarding the management of occupationally related reproductive risk must be made within the context of two Federal statutes: the Occupational Safety and Health Act, and the Civil Rights Act. These may be viewed as contradictory because steps taken to protect the health of the embryo/fetus may interfere with female workers' employment opportunities.

Toxic substances are unlikely to be regulated solely for their reproductive health effects because most agents that affect reproductive health have other health effects as well. To date, four health hazards—ionizing radiation, lead, ethylene oxide, and dibromochloropropane—are regulated in part because of their effects on reproductive capacity. The report reviews evidence for workplace-induced reproductive impairment, the existing regulatory structure, and options for compensation for workers who have been or may be reproductively harmed in the workplace.

Key Contact: Gretchen Kolsrud 226-2090.

Published: December 1985. Summary available.

Requested by: House Committee on Science and Technology
House Committee on Agriculture, Subcommittee on Department Operations, Research, and Foreign Agriculture
Senate Committee on Labor and Human Resources

Alternatives to Animal Use in Research, Testing, and Education (R)

Toxicity testing
Biomedical research
Behavioral research
Education
Animal welfare

Popular estimates of yearly laboratory animal use in the United States range from 10 to 100 million, and public interest in animal welfare has sparked an often emotional debate over such uses of animals. Concerns focus on replacing, reducing, and refining the use of laboratory animals. OTA examines the scientific, regulatory, economic, legal, and ethical considerations involved in alternative technologies in biomedical and behavioral research, toxicity testing, and education. Included is an examination of Federal, State, and institutional regulation of animal use, and a review of recent developments in 10 other countries. The report identifies seven principal policy issues: using existing alternatives, developing new alternatives, disseminating research and testing information, restricting animal use, counting animals used, establishing a Federal animal-use policy, and amending the Animal Welfare Act.

Project Director: Gary Ellis 226-2090.

Published: February 1986. Summary available.

Requested by: Senate Committee on Labor and Human Resources
House Committee on Science and Technology, Subcommittee on Science, Research, and Technology

Food & Renewable Resources (226-2266)

Innovative Biological Technologies for Lesser Developed Countries (WP)

Agricultural research
Agricultural innovations

This workshop proceeding reviews innovative biological technologies that the Agency for International Development could use to help lesser developed countries enhance the productivity of their soils, reduce their need for costly chemical fertilizers, and increase food supplies.

Key Contact: Walter Parham 226-2264.

Published: September 1981; Reprinted, July 1985.

Requested by: House Committee on Foreign Affairs

Africa Tomorrow: Issues in Technology, Agriculture, and U.S. Foreign Aid (TM)

Agriculture
Africa
Food supply
Technology transfer

The United States has a stake in the agricultural development of sub-Saharan Africa. Alleviating hunger and malnutrition, expanding stable markets for U.S. products, and maintaining the availability of critical and strategic materials provide humanitarian, economic, and political reasons for a continuing American interest in Africa. Most African countries are predominantly agricultural and their well-being and future development are tied closely to that sector. Therefore, agricultural assistance probably will continue to be a major area of U.S. involvement.

This technical memorandum outlines major issues constraining the development and transfer of sustainable technologies for low-resource food producers. The findings reflect broad consensus on which potential congressional action can be based.

Project Director: Phyllis Windle 226-2265.

Published: December 1984.

Requested by: House Select Committee on Hunger

Technology and Public Policy To Enhance Grain Quality in International Trade (R)

Grain production
Farming
Agriculture
International competition

U.S. agriculture is beginning to show signs of declining international competitiveness. For U.S. grains, the major component of agricultural exports, quality is becoming a growing reason for this decline. Complaints from foreign buyers have surged in recent years and congressional concern is growing about the poor quality of U.S. grain. Grain producers already are having difficult financial times and the loss of sales for quality reasons adds to their further problems.

In congressional debate of the Food Security Act of 1985, legislative proposals were discussed on how best to improve U.S. grain quality. It became quite apparent that little is known about this area, so Congress amended the Food Security Act to direct the Office of Technology Assessment to conduct a study on grain-handling technologies and export quality standards. The study is to provide information on: 1)

competitive problems the United States faces in international grain markets attributed to grain quality; 2) the extent to which U.S. grain-handling technologies and quality standards have contributed to declining grain sales; 3) differences in grain-handling technology and export quality standards between the United States and competitor countries; 4) consequences to exporters and farmers to changes in grain-handling technologies and quality standards; and 5) feasibility of utilizing new technology to better classify grains.

Project Director: Mike Phillips 226-2189.

Estimated publication date: Summer 1988.

Requested by: House Committee on Agriculture and its Subcommittee on Department Operations; Research, and Foreign Agriculture
Joint Economic Committee

Low-Resource Agriculture in Africa (R)

Agriculture
Food production
Technology transfer

Most people in developing countries are subsistence farmers who cannot obtain or afford the expensive fertilizers and pesticides on which high-yield (Green Revolution) technologies are based. Thus, as populations grow and fuel prices rise, low-resource agricultural technologies are receiving increased attention from donors and researchers. For example, international donors such as the Peace Corps and the World Bank are giving high priority to research and development projects that enhance rather than replace low-resource, traditional farming methods. This is particularly true for programs in Africa where subsistence farmers hold the key to increasing food production and where the continuing need for massive food aid demonstrates the failure of many past agricultural, development assistance, and resource protection policies.

By examining low-resource agriculture worldwide, this assessment will help Congress evaluate programs and formulate policies related to both U.S. agriculture and foreign policy. In order to do this, OTA will: 1) determine which of these technologies can increase African food production in socioeconomically and environmentally sustainable ways, 2) identify the U.S. role in technology development and transfer, 3) assess actual and potential benefits to the U.S. from participation in international agricultural research on low-resource methods, and 4) evaluate certain aspects of the Sahel Development Program as a case study in U.S. public and private assistance to Africa.

Project Director: Phyllis Windle 226-2265.

Estimated publication date: Summer 1987.

Requested by: Technology Assessment Board
House Committee on Agriculture
House Committee on Science and Technology, and the Subcommittee on Natural Resources, Agricultural Research, and Environment
House Select Committee on Hunger

Continuing the Commitment: Agricultural Development in the Sahel (SR)

Agriculture

This special report examines the record of assistance to nine nations of the Sahel in West Africa, explores the lessons learned in a decade of efforts, and suggests policy implications for improved U.S. assistance there and elsewhere in Africa. The report emphasizes the technical and institutional factors that constrain development in one of the poorest regions in the world.

Project Director: Phyllis Windle 226-2265.

Published: August 1986.

Requested by: Technology Assessment Board
House Committee on Agriculture
House Committee on Science and Technology, and the Subcommittee on Natural Resources, Agriculture Research, and Environment
House Select Committee on Hunger

Integrated Renewable Resource Management for U.S. Insular Areas (R)

Agriculture
Food production
Renewable resources

U.S. insular areas in the Caribbean (Puerto Rico and the U.S. Virgin Islands) and the Pacific (Guam, American Samoa, Commonwealth of the Northern Marianas, Republic of the Marshall Islands; Federated States of Micronesia and Republic of Belau) have experienced considerable historical land resource degradation. Freshwater supplies may be highly variable and tropical soils and waters can be relatively infertile, requiring special management considerations. Today the U.S. territories rely heavily on food imports, and many local food production technologies and incentives have been lost.

The small size and limited resources of these insular areas require that land planning consider the capability of sites to sustain agriculture and aquaculture; the probable impacts of development on other resources; and alternatives to traditional management schemes that may be more appropriate to the economies and ecologies of these areas. Technologies designed for temperate, continental agriculture and aquaculture—frequently dependent on relatively low-cost energy supplies, large capital outlays, and well-developed markets—typically are not suitable for tropical insular areas.

OTA is assessing technological opportunities and applications that may be particularly appropriate for U.S.-affiliated islands' renewable resource management and development. In part, OTA is: 1) assessing agricultural and aquacultural technologies given the availability and quality of water and land, 2) assessing management technologies for protected natural areas and nearshore marine resources, 3) identifying analytical techniques that measure and evaluate the overall productive capability of insular renewable resources, and 4) developing analyses of possible options for congressional consideration.

Project Director: Alison Hess 226-2223.

Estimated publication date: Spring 1987.

Requested by: Senate Committee on Energy and Natural Resources
House Committee on Interior and Insular Affairs, and its Office of Insular Affairs

Technologies To Benefit Agriculture and Wildlife (WP)

Wildlife
Agricultural research
Natural resources

This workshop proceeding presents a broad range of papers on specific technologies that could benefit both agricultural production and wildlife habitat requirements on private lands. It also describes some constraints and opportunities to integrate agriculture and wildlife concerns and discusses policy opportunities to improve agriculture and wildlife integration.

The objectives and goals of agricultural policy and wildlife conservation policy need not be mutually exclusive. Opportunities exist for U.S. agriculture to apply new or emerging technologies that could maintain or even increase production of crops, livestock, and timber while sustaining wildlife. More, however, could be done to promote the application of such resource-sustaining technologies.

Project Director: Susan Shen 226-2256.

Published: May 1985.

Requested by: Senate Committee on Agriculture, Nutrition, and Forestry, Subcommittee on Conservation, Forestry, and Environment

Technology, Public Policy, and the Changing Structure of American Agriculture (R)

Agricultural policies
Farms
Agricultural innovations

During the past three decades, technological change and innovation in biological systems, labor-saving mechanization, transportation, and agricultural chemicals have played an important role in increasing agricultural productivity. They have also contributed to changing the very nature of agriculture. Today, farm operators account for only 3 percent of the U.S. population. Twenty percent of all farms now produce 80 percent of the food and fiber in the United States. Increased capital and kinds of skill are needed to sustain farms. Such changes have important implications for society.

Technology is only partly responsible for these changes. Public policy has also played a role. However, little is known about how policies in conjunction with technology adoption have affected structural change.

This assessment focuses on future and emerging technologies in the animal, plant, chemical, mechanization, and information areas and their implications for agriculture. It assesses the possibility of developing technologies for different kinds of agricultural structures. The assessment also explores links between policy and structure so policymakers can have a clearer understanding of the factors that influence the evolution of the agricultural sector.

Project Director: Mike Phillips 226-2189.

Published: March 1986.

Requested by: House Committee on Science and Technology, and its Subcommittee on Natural Resources, Agricultural Research, and Environment
House Committee on Agriculture, Subcommittee on Livestock, Dairy, and Poultry; Subcommittee on Department Operations, Research, and Foreign Agriculture; and Subcommittee on Forests, Family Farms, and Energy
Senate Committee on Small Business, Subcommittee on Small Business: Family Farm
Senate Committee on Agriculture, Nutrition, and Forestry
Joint Economic Committee, and its Subcommittee on Agriculture and Transportation

A Special Report for the 1985 Farm Bill (SR)

Agriculture
Commodity
Agricultural research

This is part of OTA's assessment of *Technology, Public Policy and the Changing Structure of American Agriculture*. It was prepared to provide assessment findings which were relevant to the 1985 Farm Bill discussions. The report focuses on three main policy areas: 1) commodity, 2) credit, and 3) research and extension. It also summarizes background information on emerging technologies and trends in structural change.

Project Director: Mike Phillips 226-2189.

Published: March 1985.

Requested by: Senate Committee on Agriculture
Senate Committee on Small Business, Subcommittee on Small Business: Family Farm
Joint Economic Committee
House Committee on Science and Technology
House Committee on Agriculture, Subcommittee on Livestock, Dairy, and Poultry; Subcommittee on Department Operations, Research, and Foreign Agriculture; and Subcommittee on Forests, Family Farms, and Energy

Technologies To Maintain Biological Diversity (R)

Agricultural development
Natural resources
Genetic engineering

Maintaining biological diversity of plants and animals is necessary to sustain and improve agriculture, to keep open future options for medical discoveries, and to maintain the raw material for industrial innovation and genetic engineering. Agricultural development needs wild plants as a source of new genes to increase yields, to improve disease resistance, and to increase the ability of crops to withstand extreme environmental stresses. Wild plants are used by the pharmaceutical industry as sources of valuable compounds that, once discovered in nature, sometimes can be synthesized in the laboratory. Animal physiology affords many clues to the origins and nature of human ailments. For example, the cotton-topped marmoset, a species of monkey susceptible to lymphatic cancer, is helping to produce a potent anticancer vaccine. Genetic engineering, an emerging technology with great potentials for agriculture, depends on biological diversity for the raw material to engineer. Thus, loss of diversity could reduce the potential opportunities that this technology offers. But while the importance of diverse biological resources is receiving increasing attention, diversity appears to be declining and valuable reservoirs of germplasm seem to be disappearing.

In order to identify opportunities to maintain biological diversity, OTA will: 1) assess the status of biological diversity and its rates of change in various regions; 2) assess the economic, social, ecological, and political implications of a decline in biological diversity; 3) assess technologies (both in situ and ex situ) to maintain plant and animal biological diversity; 4) assess the role of institutions and U.S.-funded agencies (e.g., United Nations and World Bank) in developing and transferring beneficial technologies for maintaining biological diversity; and 5) identify policy options that will facilitate the development and use of such technologies to maintain biological diversity.

Project Director: Susan Shen 226-2256.

Estimated publication date: Spring 1987. Interim publications:
"Grassroots Conservation of Biological Diversity in the U.S." (BP), published February 1986.

"Biological Diversity in the United States: Data Considerations" (BP), published April 1986.

Requested by: Senate Committee on Agriculture, Nutrition, and Forestry
Senate Committee on Foreign Relations
House Committee on Science and Technology
House Committee on Merchant Marine and Fisheries, and its Subcommittee on Fisheries and Wildlife Conservation and the Environment
House Committee on Foreign Affairs, and its Subcommittee on International Economic Policy and Trade, and Subcommittee on Human Rights and International Organizations
House Committee on Aging

Health Program (226-2070)

Preventing Illness and Injury in the Workplace (R)

Occupational health and safety
Government regulation

One hundred million Americans work. Each year there are some 2.3 million disabling injuries and 13,200 accidental deaths in the workplace, and perhaps 100,000 people die from job-related diseases. Efforts to reduce this toll involve employers, labor organizations, nonprofit institutions, insurance companies, and government agencies. To a major extent these efforts are directed at developing and applying control technologies—engineering controls, worker education programs, and personal protection devices.

New industrial plant construction and modernization of existing plants are expected to result from interest in increased productivity and reduced energy consumption. Such construction may offer opportunities for installing new technologies to reduce workplace health and safety hazards.

This assessment develops information about research and development, diffusion, application, and evaluation of workplace control technologies. Engineering controls, worker education programs, personal devices, and interrelationships between them are described and their role in worker protection evaluated.

One product of the assessment is a series of options that address: improving data about workplace accidents and illnesses; aiding development of appropriate technologies, their diffusion, application, and evaluation; and making control technologies available to small firms at a price they can afford.

Key Contact: Karl Kronebusch 226-2070.

Published: April 1985. Summary available.

Requested by: Senate Committee on Labor and Human Resources
House Committee on Education and Labor, Subcommittee on Labor Standards
House Committee on Energy and Commerce

Abstracts of Case Studies in Health Technology Case Study Series

This booklet contains a description of the OTA "Health Technology Case Study Series" and abstracts of each of the case studies published.

Series Coordinator: Ginny Cwalina 226-2070.

Published: December 1986.

Federal Policies and the Medical Devices Industry (R)

Medical instruments and apparatus
Biomedical materials
Medicare/Medicaid
Regulation

During the past two decades, technologies such as automated blood chemistry analyzers, ultrasound imaging, and cardiac pacemakers have become common elements of medical diagnosis and therapy. The growth of the industry that manufactures such technologies has paralleled the growth of expenditures for medical care. The industry's sales totaled an estimated $13 billion in 1981, more than three times the 1972 level and 11 times the amount in 1958.

Congress is continually called on to develop policies that will affect the medical devices industry, but in the past has lacked adequately analyzed information to deal with the subject. Federal policies related to the research, marketing, location, and financing (medical insurance) of medical technologies, as well as to the taxation, patenting, and foreign trade of all technologies, affect the development, manufacture, and sale of medical devices.

This assessment presents basic information about the medical devices industry and analyzes the implications of alternative Federal policies. It develops information about the nature of firms that manufacture medical technologies, conducts case studies of selected medical devices, and examines present and proposed Federal policies that influence the medical devices industry and affect the cost and effectiveness of medical devices.

Project Director: Jane Sisk 226-2070.

Published: October 1984. Summary available.

Requested by: Senate Committee on Labor and Human Resources
Senate Committee on Veterans' Affairs

Nuclear Magnetic Resonance Imaging Technology: A Clinical, Industrial, and Policy Analysis (CS)

Magnetic resonance
Medical imaging
Medical devices
Health care industry
Health insurance

This case study provides a "snapshot view" of the scientific and clinical status of nuclear magnetic resonance (NMR) imaging—an exciting new diagnostic imaging modality that has captured the interest of the medical and scientific communities and the general public. The study also provides an overview and analysis of the impact of various Federal and non-Federal policies and practices in the development and diffusion of NMR imagers as of August 1984. The policies examined include the Food and Drug Administration's premarket approval process; Health Care Financing Administration, Blue Cross/Blue Shield, and commercial insurance company reimbursement decisions; State certificate-of-need policies, and Federal financial support for research and development.

Project Director: Jane Sisk 226-2070.

Published: September 1984.

Requested by: Senate Committee on Labor and Human Resources
Senate Committee on Veterans' Affairs

The Boston Elbow (CS)

Prosthetics
Physically handicapped
Medical devices
Disability benefits
Rehabilitation

The Boston Elbow is an artificial arm, battery-powered and myoelectrically controlled (i.e., controlled by signals from an amputee's stump muscles). This prosthetic device reproduces elbow flexion and extension. This device is only one of several compensatory options for people who have lost an arm. Nonprosthetic measures as well as competing prostheses are available to most amputees.

Distribution of the Boston Elbow and other compensatory options is at least in part a function of public policy, especially the design and implementation of disability benefits programs. For policy purposes, peo-

ple (excluding children) with disabilities seem to fall into three groups—veterans, workers, and citizens—each with eligibility criteria set by law. This case study shows how the Boston Elbow fares differently in different programs intended for these groups.

Project Director: Jane Sisk 226-2070.

Published: November 1984.

Requested by: Senate Committee on Labor and Human Resources
Senate Committee on Veterans' Affairs

The Market for Wheelchairs: Innovations and Federal Policy (CS)

Wheelchairs
Physically handicapped
Medical devices
Health care industry
Rehabilitation

The characteristics, prices, and durability of wheelchairs are critical both to the quality of life of their users and to the costs incurred by the users, insurers, and government agencies. This case study focuses on how Federal policies affect innovations in wheelchair characteristics. The case study presents two examples of innovations in wheelchair design, the Power Rolls IV made by Invacare Corp. and a curb-climbing wheelchair available in parts of Europe, but not the United States. It examines the wheelchair market and notes that 1 American in 200 (approximately 1.2 million total in 1977) is a wheelchair user.

The case study also discusses Federal policies relating to wheelchairs. Although Federal research and development efforts on wheelchairs appear modest in relation to the number of users, the Federal Government is a major purchaser of wheelchairs through the Veterans Administration, Medicaid, and Medicare. The Food and Drug Administration classifies and regulates the marketing of wheelchairs under its authority to regulate medical devices. Finally, the study discusses public policy issues related to the wheelchair industry.

Project Director: Jane Sisk 226-2070.

Published: November 1984.

Requested by: Senate Committee on Labor and Human Resources
Senate Committee on Veterans' Affairs

The Contact Lens Industry: Structure, Competition, and Public Policy (CS)

Contact lenses
Health care industry
Medical devices

This case study analyzes the contact lens industry in the United States. The study analyzes the relationship between industry structure and behavior, or the influence that the number, size, market power, and policies of the makers of contact lenses have on their incentives and behavior regarding competition in product development and price. It also analyzes the role played by public policy in influencing this competition, either directly or indirectly. The more important elements of public policy affect: 1) mergers, 2) market entry, 3) competition in the professional prescribing and fitting of contact lenses, and 4) the payment mechanism in the purchasing process.

Project Director: Jane Sisk 226-2070.

Published: December 1984.

Requested by: Senate Committee on Labor and Human Resources
Senate Committee on Veterans' Affairs

The Hemodialysis Equipment and Disposables Industry (CS)

Hemodialysis equipment
Disposables
Medical devices
Health care industry

In the course of treatment for end-stage renal disease (ESRD), which afflicts approximately 96,000 people in the United States, most patients and their providers use an array of products produced by the hemodialysis equipment and supplies industry. This case study offers an economic analysis of this relatively new U.S. industry. The industry's existence is a consequence of modern medical advances that have made hemodialysis a viable treatment of ESRD. Moreover, it would be difficult to think of another industry that has been so clearly and directly shaped by Federal policy.

Project Director: Jane Sisk 226-2070.

Published: December 1984.

Requested by: Senate Committee on Labor and Human Resources
Senate Committee on Veterans' Affairs

Technologies for Managing Urinary Incontinence (CS)

Urinary
Urinary incontinence
Medical devices
Aged
Disability
Handicap

Urinary incontinence represents a medical problem that is prevalent among the elderly and has enormous consequences for medical care costs. It is also an area in which medical devices with widely varied characteristics are used to manage or cure the underlying conditions. These devices complement other approaches to the management of urinary incontinence, and an analysis of the respective roles of alternative strategies is useful. Although the case study emphasizes mechanical devices over more conventional and widely used treatments for incontinence, such as drugs, surgery, and bladder-training procedures, these other treatments are also discussed. Evidence on the effectiveness and costs of alternative treatments is presented, and implications for public policy are discussed.

Project Director: Jane Sisk 226-2070.

Published: July 1985.

Requested by: Senate Special Committee on Aging
House Select Committee on Aging

Medical Devices and the Veterans Administration (TM)

Veterans
Medical instruments and apparatus

This technical memorandum emphasizes internal Veterans Administration (VA) policies and procedures related to medical devices. It provides information from three different prospectives: that of the veteran as a consumer, that of the device industry as a supplier, and that of the VA itself. Topics addressed, for example, include the VA's effect on private research and development and decisionmaking more generally.

Key Contact: Jane Sisk 226-2070.

Published: February 1985.

Requested by: Senate Committee on Labor and Human Resources
Senate Committee on Veterans' Affairs

The Impact of Randomized Clinical Trials (RCTs) on Health Policy and Medical Practice (BP)

Clinical trials
Medical technology assessment
Clinical decisionmaking

Rational decisions at all levels in health care—from Federal Government policymaking to the treatment of a single patient by a physician—require sound information. Randomized clinical trials (RCTs), a family of experimental designs, provide the highest quality of evidence for the efficacy and safety of medical technologies. RCTs fill an obvious need for information, yet their impact in health policy and medical care remains largely undocumented. This background paper brings together the literature and current views about the actual and potential role of RCTs in decisionmaking about medical technology.

In addition to descriptive historical and background information about RCTs, the chapters focus on the following topics:

- funding of RCTs and some nonrandomized clinical trials,
- current and possible future users of RCTs in health policymaking,
- criticisms of and alternatives to RCTs,
- characteristics of RCTs that appear to influence their impact,
- the published literature specifically about the impacts of RCTs on medical practice, and
- suggestions for strengthening the impact of RCTs.

Project Director: Hellen Gelband 226-2070.

Published: August 1983.

Requested by: Office of Technology Assessment

The Quality of Medical Care: Information for the Consumer (R)

Quality assessment
Health care delivery
Quality of care
Health insurance
Consumers

The general public relies on physicians and other medical providers for advice about medical technologies and referrals. But lay people still face the problem of evaluating the quality of care delivered by these providers. Public concern about this situation has grown as Federal and State governments, private insurers, and employers have increased efforts to moderate medical expenditures. There is concern that appropriate use of technologies and quality of care could be sacrificed as providers and plans in turn intensify activities to constrain their costs. More information is also important to enable the health care market to work efficiently.

This study would evaluate possible techniques for assessing quality of care to ascertain whether valid information could be developed and made available to the public. Quality and its possible measurement have multiple dimensions. Technical aspects of quality matter to medical providers, consumers, and society, but consumers may place more emphasis than providers on interpersonal aspects. At the societal level there is interest in equitable distribution of medical technologies and public health benefits of care. These dimensions of quality can be described and assessed by indicators of the structure, process, and outcome of care. The OTA study would examine available methodologies and develop criteria, such as validity, to evaluate possible quality indicators for hospitals, physicians, and health plans. In its policy options, the study would consider the availability and costliness of data, organizational

responsibility for quality assessment and information dissemination, and the use of quality assessment results.

Project Director: Jane Sisk 226-2070.

Estimated publication date: Spring 1988

Requested by: House Committee on Energy and Commerce, and the Subcommittee on Health and the Environment
House Committee on Science and Technology
Senate Special Committee on Aging

Diagnostic Medical Tests: Impact on Public and Private Policies Toward Health Care (R)

Diagnostic tests
Home testing
Predictive medical tests
AIDS
Health insurance

Tests to identify individuals who are likely to develop serious diseases are being rapidly developed. Some of these tests are directed at genetic diseases for which there are no known therapies, thereby raising questions over the social consequences of identifying susceptible persons. Use of the test for detecting antibodies to the AIDS virus is already a highly controversial issue. The use of diagnostic tests by health insurance companies, self-insured businesses, and health maintenance organizations may lead to substantial costs to government if private insurance becomes very costly or unavailable. While the Federal Government plays an important role in financing health care, the regulation of health insurance is largely a State function. This assessment would: 1) identify the tests in use and under development, 2) identify how such tests are used in setting insurance rates for employees and their dependents or in excluding such individuals from coverage, 3) estimate the number of people who could be affected, 4) estimate the health care costs for treating or caring for affected individuals, and 5) develop policy options vis á vis the Federal role in relationship to State and private sector actions and responsibilities.

Project Director: Larry Miike 226-2070

Estimated publication date: Spring 1988.

Requested by: House Committee on Energy and Commerce, and the Subcommittee on Health and the Environment
House Committee on Government Operations, Subcommittee on Intergovernmental Relations and Human Resources
House Committee on Science and Technology, Subcommittee on Natural Resources, Agriculture Research, and Environment
House Committee on Ways and Means

Strategies for Medical Technology Assessment (R)

Medical technology assessment
Clinical trials
Safety and efficacy
Cost-effectiveness

This report considers the flow of information that is central to an effective system of medical technology assessment. OTA found that the current system for evaluating emerging, new, and existing medical technologies is inadequate in a number of respects. One of the biggest problems is that the activities of the multiple public and private sector participants in the system are not well coordinated. Furthermore, some classes of medical technologies are not adequately evaluated for safety, efficacy, cost-effectiveness, or social and ethical implications prior to their adoption by the health care system.

OTA concludes that a more integrated system for assessing medical technologies, possibly with stronger links between Federal agencies and private sector organizations such as medical specialty societies, might be more effective. The report discusses methods and data that can be used to measure a medical technology's outcomes as well as the methods and mechanisms that can be used to synthesize the various types of information.

Key Contact: Kerry Kemp 226-2070.

Published: September 1982.

Requested by: House Committee on Energy and Commerce

Blood Policy and Technology (R)

Blood diseases
Blood banks

Over the past decade, there have been major changes in the technologies for dealing with blood collection and distribution and for monitoring the quality of blood products. Research on blood and its components promises to lead to further changes. The supply system, however, remains dependent on human sources, and voluntary donations, rather than paying for blood, have been encouraged. Today, less than 5 percent of all whole blood collected in the United States is bought. However, use of blood components instead of whole blood has increased significantly. Commercial plasma collection centers account for about 70 percent of U.S. plasma production, and the United States is a major exporter of plasma and its components.

A newly discovered disease, acquired immunodeficiency syndrome (AIDS), has recently been linked to blood products. It may have significant impacts on the blood donor system: 1) What technologies are available to screen donors without discouraging donations? and 2) What technologies can be used to protect those receiving blood from the disease?

This report assesses technologies affecting the availability, uses, and risks of blood. It examines promising new technologies for: 1) blood collection, processing, storage, and distribution; 2) identification, isolation, production, and use of blood components; 3) blood substitutes; and 4) identification and prevention of blood-transmitted diseases and other risks.

Project Director: Larry Miike 226-2070.

Published: January 1985. Summary available.

Requested by: House Committee on Energy and Commerce

Review of the Public Health Service's Response to AIDS (TM)

AIDS
Public health
Blood diseases

This study reviews the recent and proposed activities of the Public Health Service (PHS) in response to acquired immunodeficiency syndrome (AIDS), and evaluates the planning, resources, and staffing of PHS's efforts to control AIDS. In particular, the memorandum examines: 1) the adequacy of PHS's confirmation of the causal relationship

between the newly discovered retrovirus HTLV-III and AIDS and the adequacy of research to identify other possible agents involved; 2) the adequacy and timeliness of PHS's redirection of general AIDS research toward HTLV-III work, including research on blood, on treatment protocols, on animal models, and on epidemiological work; 3) the adequacy and scope of efforts to develop vaccines against the disease; 4) the adequacy and timeliness of the distribution of new knowledge and information among researchers and regulators; and 5) the adequacy of PHS resources to support needed activities that would yield the best chances for immediate results in the prevention and treatment of AIDS.

Project Director: Larry Miike 226-2070.

Published: February 1985.

Requested by: House Committee on Energy and Commerce, Subcommittee on Health and the Environment
House Committee on Government Operations, Subcomittee on Intergovernmental Relations and Human Resources

Monitoring of AIDS-Related Activities

AIDS
Public health
Blood testing

This is a continuation of the OTA technical memorandum *Review of the Public Health Service's Reponse to AIDS*. The study will continue to monitor the coordination and allocation of Federal resources on AIDS research, as well as research in such areas as the transmissibility and natural history of the disease, the development of new treatments, and the progress on vaccine efforts. The study will also focus on the use of the blood test for detecting exposure to the HTLV-III virus, the Public Health Service efforts on AIDS education and preventive practices, and the Department of Health and Human Service's role in the delivery and financing of clinical care to AIDS patients.

Project Director: Larry Miike 226-2070.

Estimated publication date: Ongoing.

Requested by: House Committee on Energy and Commerce, Subcommittee on Health and the Environment
House Committee on Government Operations, Subcomittee on Intergovernmental Relations and Human Resources

Technologies for Detecting Heritable Mutations in Human Beings (R)

Genetic research
Blood testing
Human mutations

Mutations are permanent changes in the genetic information contained in chromosomes and DNA of cells. When they occur in germ cells—egg or sperm cells—they are passed on to succeeding generations. Always a concern in public health, mutations are becoming a policy issue because of claims that they have been caused by exposures to radiation and chemicals. Little is known about the frequency of human mutations, and evidence is insufficient to decide whether or not external factors contribute in any significant way to the frequency despite the reasonable contention that they probably do.

Technologic breakthroughs may make it possible to determine mutation rates directly. The new methods require drawing blood and analyzing proteins or DNA or a particular gene for genetic changes.

This assessment: 1) details the status and limits of knowledge about human mutation and mutation frequencies, 2) reviews the current methods used to study human mutations, 3) describes methods now under development and being considered, 4) estimates when each of the new methods might be available for studying human populations and the size of the experiments that would be necessary to produce useful results, and 5) develops policy options to spur the research and application of appropriate methods.

Project Director: Hellen Gelband 226-2070.

Published: September 1986. Summary available.

Requested by: Senate Committee on Veterans' Affairs
House Committee on Science and Technology
House Committee on Energy and Commerce

Medical Technology and Costs of the Medicare Program (R)

Medicare/Medicaid
Medical instruments and apparatus
Health insurance

The report covers a broad range of mechanisms to limit Medicare costs related to medical technology. The first part of the report presents information on the interactions between medical technology and Medicare. It analyzes specific Medicare policies--eligibility, benefits, payment, and beneficiary cost-sharing policies—that have been important to the adoption and use of medical technology. In addition, it reviews evidence on the contributions of medical technology to increases in general health care costs and in Medicare costs.

The second part of the report provides information on policies that have been and could be used to influence medical technology adoption and use and restrain the increase in Medicare program costs. It covers four general areas: coverage of specific technologies, payment to hospitals, payment to physicians, and approaches to changing incentives for the adoption and use of technologies that do not directly involve Medicare payment. Finally, it presents options for congressional consideration.

Project Director: Anne Burns 226-2070.

Published: July 1984. Summary available.

Requested by: House Committee on Energy and Commerce
Senate Committee on Finance

The Effectiveness and Costs of Alcoholism Treatment (CS)

Alcoholism
Aversion therapy
Detoxification
Inpatient treatment
Health insurance

Alcoholism constitutes a vast syndrome of medical, economic, psychological, and social problems. From 10 to 15 million Americans are either alcoholic or have serious problems directly related to the abuse of alcohol. The economic cost of alcoholism and alcohol abuse, a major portion of which is lost work productivity, may be as high as $120 billion annually.

For the small proportion of alcoholics or alcohol abusers actually receiving treatment, the aggregate costs of treatment have risen substantially. In 1982, Medicare alone spent an estimated $150 million for the treatment of alcoholism. Modalities of treatment for alcoholism include the use of drugs, psychologically based treatments, and treatments based on group and community efforts.

The available research evidence, reviewed in this study, seems to indicate that any treatment of alcoholism is better than no treatment. Medicare and Medicaid have encouraged the use of inpatient, medically based treatment for alcoholism. The available evidence seems to indicate that medically based inpatient rehabilitation services are far more expensive, but not necessarily more effective, than primarily nonmedical inpatient or outpatient treatment. Further research is needed both to specify how to match patients to treatment and setting and to test competing claims of effectiveness.

Key Contact: Anne Burns 226-2070.

Published: March 1983.

Requested by: Senate Committee on Finance, Subcommittee on Health

Diagnosis-Related Groups and the Medicare Program: Implications for Medical Technology (TM)

Diagnosis-related groups
Medicare
Prospective payment
Hospitals

Prepared in conjunction with the OTA's assessment *Medical Technology and Costs of the Medicare Program*, this technical memorandum examines diagnosis-related groups (DRGs) and their implications for use in Medicare's prospective payment system. The study reviews the development of DRGs and compares them to alternative case-mix measures. It also includes an analysis of the implications for medical technology use and adoption of using DRGs as an integral part of a per-case hospital payment system. A principal finding of the study is that while DRGs are ready for use in a per-case payment system, their implementation needs to be closely monitored. In the long run, the study concludes, the success of DRG payment will rest heavily on its flexibility and adaptability to technological change.

Project Director: Anne Burns 226-2070.

Published: July 1983.

Requested by: House Committee on Energy and Commerce, and its Subcommittee on Health and the Environment
Senate Committee on Finance, Subcommittee on Health

Intensive Care Units: Costs, Outcome, and Decisionmaking (CS)

Intensive care
Biomedical ethics
Health insurance
Clinical outcomes
Health care costs

This case study provides an overview of the development of intensive care units (ICUs) and their rapid diffusion into medical practice, and presents information on their utilization costs and reimbursement. It also describes various measures of outcomes of intensive care and

reviews the outcome literature. Finally, it discusses the intricacies of decisionmaking in the ICU and policy implications of ICUs.

Project Director: Anne Burns 226-2070

Published: October 1984

Requested by: House Committee on Energy and Commerce, and the Subcommittee on Health and the Environment
Senate Committee on Finance

The Cost-Effectiveness of Digital Subtraction Angiography in the Diagnosis of Cerebrovascular Disease (CS)

Cerebrovascular disease
Imaging systems in medicine
Digital subtraction fluoroscopy
Medical devices

Digital subtraction angiography (DSA) is a new and rapidly developing technology in the field of diagnostic radiology. DSA is one of several computer-assisted radiologic tools for diagnosing conditions associated with the internal structure of blood vessels.

This case study selects a single category of clinical problems where DSA is in use on a broad scale—cerebrovascular disease—as the context within which the cost-effectiveness of DSA is explored.

Project Director: Anne Burns 226-2070

Published: May 1985

Requested by: House Committee on Energy and Commerce, and the Subcommittee on Health and the Environment
Senate Committee on Finance, Subcommittee on Health

The Effectiveness and Costs of Continuous Ambulatory Peritoneal Dialysis (CS)

Hemodialysis
Medicare/Medicaid
Health care
Medical devices

The advent of continuous ambulatory peritoneal dialysis (CAPD) in the late 1970s has dramatically changed treatment options available to the patient with end-stage renal disease (ESRD). Since it was approved for reimbursement by Medicare in 1979, the use of CAPD has increased rapidly, and, by 1983, an estimated 8,000 patients, two-thirds of patients on home dialysis, or 12 percent of the entire chronic dialysis population were being treated by this modality. Diffusion has resulted from a combination of strong professional endorsement, patient acceptance, and vigorous marketing efforts by industrial producers of CAPD supplies and equipment. Some projections suggest that up to 40 percent of the ESRD population may be suitable candidates for CAPD.

This study: 1) compares the medical effectiveness of hemodialysis (HD) performed in dialysis centers and hospitals with CAPD or HD performed at home, 2) evaluates the costs of treatment by each of these modalities, and 3) identifies critical issues that require further evaluation.

Project Director: Anne Burns 226-2070

Published: September 1985

Requested by: Senate Committee on Finance

OTA's First Report on the Prospective Payment Assessment Commission (ProPAC) (SR)

Health insurance
Medicare
Prospective payment
Medical technology assessment
Diagnosis related groups

The Prospective Payment Assessment Commission (ProPAC) is an independent commission established by Congress to make recommendations to the Secretary of Health and Human Services and Congress about changes in Medicare's prospective payment system established under the Social Security Amendments of 1983. OTA is responsible for oversight of the Commission.

This special report contains information on the appointments and staffing of ProPAC, the organization of the Commission, the status of various administrative and operating activities, and the substantive areas of concentration. It discusses the Commission's progress in key areas of operation and contains questions that Congress, and therefore OTA, may wish to analyze in the coming year. The key finding is that ProPAC's overall performance in its first year of operation has been of a high order, and in some respects exceptionally high.

Project Director: Anne Burns 226-2070.

Published: March 1985.

Requested by: Mandated study.

OTA's Second Report on the Prospective Payment Assessment Commission (ProPAC) (SR)

Prospective payment

This special report is the second response to the mandate and covers ProPAC's second full year of operations. The primary goal of this report is to provide Congress with an update on the Commission's operations since the first OTA report. Another goal is to begin to lay the groundwork for any oversight hearings that the congressional authorizing committees might wish to conduct on the role of ProPAC in the prospective payment system as ProPAC moves from a new to an established organization.

Project Director: Anne Burns 226-2070.

Published: March 1986.

Requested by: Mandated study.

Medicare's Prospective Payment System: Strategies for Evaluating Cost, Quality, and Medical Technology (R)

Medical economics
Medical innovations
Medicare
Prospective payment
Diagnosis-related groups
Health insurance

In order to control the rapidly rising costs of the Medicare program, the Social Security Amendments of 1983 mandated a new Medicare hospital payment system: prospective payment based on diagnosis-related groups (DRGs). The new system is radically different from previous ones. Plans must be made for a comprehensive evaluation of its effects, and assumptions about its implications must be explicitly tested. One of the key areas of impact will be on the development and use of medical technology. The study addresses the following issues:

- the range of possible effects related to medical technology and its use;

- evaluation measures;
- ongoing or planned monitoring and evaluation activities;
- shortcomings and gaps in these activities; and
- the overall design for evaluation, including timing, methodology, priorities, and the role of current or planned efforts.

Project Director: Judith Wagner 226-2070.

Published: October 1985. Summary available.

Requested by: Senate Committee on Finance
Senate Special Committee on Aging

Payment for Physician Services: Strategies for Medicare (R)

Physicians directly or indirectly account for an estimated 80 percent of expenditures on medical technologies. Efforts to control the use and cost of medical technology have concentrated on hospitals, as evidenced by the current approach under Medicare to pay hospitals according to diagnosis-related groups (DRGs). But attention is increasingly turning to physicians, because as gatekeepers, they control much of technology use and because technologies may move out of locations where payment is constrained and into physicians' offices and other ambulatory sites. In addition, Medicare expenditures on physician services have been growing more rapidly than those for hospital care.

Physicians
Medicare/Medicaid
Health care expenditures
Prospective payment

In accordance with a provision in the Deficit Reduction Act of 1984 (Public Law 98-369), OTA examined alternative methods of paying physicians under the Medicare program, with particular attention to the use and cost of medical technology.

The study examined current patterns of physician expenditures and use, identified areas of inefficient or inequitable technology use for Medicare beneficiaries, and developed options for physician payment under Medicare to address the problems identified.

Project Director: Jane Sisk 226-2070.

Published: February 1986. Summary available.

Requested by: Senate Select Committee on Aging

Effects of Federal Policies on Extracorporeal Shock Wave Lithotripsy (CS)

Extracorporeal shock wave lithotripsy (ESWL) is a novel technology that is expensive to purchase but has the potential to reduce health system costs. It has been enthusiastically accepted by many patients, physicians, and hospitals as a treatment for many urinary stones, and it may be applied to gallstones in the near future. Whether this technology can reach its full cost-saving potential, however, is still unclear. This case study analyzes the effects of three areas of Federal health policy on the adoption, use, and costs of ESWL: premarketing regulation by the Food and Drug Administration, the payment policies of Medicare

Lithotripsy
Medical devices
Health care industry
Food and Drug Administration
Medicare

and other Federal health care payers, and the planning policies implemented through State certificate-of-need and other programs.

Key Contact: Elaine Power 226-2070.

Published: May 1986.

Requested by: House Committee on Ways and Means
House Committee on Energy and Commerce
Senate Committee on Finance
Senate Special Committee on Aging

Nurse Practitioners, Physician Assistants, and Certified Nurse-Midwives: A Policy Review (CS)

Nurses and nursing
Physicians
Cost-effectiveness
Quality of care
Access to care

This case study examines the costs, effectiveness, and payment status of nurse practitioners, certified nurse-midwives, and physician assistants in the United States. It updates and expands a 1981 OTA case study, *The Costs and Effectiveness of Nurse Practitioners*.

It covers the following areas: 1) the emergence of the professions of nurse practitioner, certified nurse-midwife, and physician assistant including Medex; 2) the effects of these professions on access to care; 3) the quality of care offered by these professions; 4) the costs associated with these professions; 5) practice location and employment data for these professions; and 6) the extent to which public programs and private health insurance pay for these professions.

The case study examines the potential effects of current major changes in the health sector on the future status of new health professionals. It contains conclusions based on the findings concerning costs and effectiveness, quality of care and access, and policy implications for federally funded training programs and reimbursement policies concerning these professions.

Project Director: Gloria Ruby 226-2070.

Published: December 1986.

Requested by: Senate Committee on Appropriations

Status of Biomedical Research and Related Technology for Tropical Diseases (R)

Tropical diseases
Biomedical research
Medical research
Developing countries

The human and financial effects of tropical diseases are enormous. Worldwide, hundreds of millions of people suffer from the various tropical diseases (e.g., malaria, trypanosomiasis, schistosomiasis, leprosy), with devastating implications for tropical countries' economies and standards of living. Because of the potential impact of technological advances in the area of tropical diseases and the historically modest levels of research and development funding in that area, it is important to examine whether Federal funds are being appropriated in a manner reflective of scientific opportunities and of the current burden posed by such diseases.

This assessment examines the status of biomedical and epidemiological research and related technology development in the area of tropical diseases. It analyzes data on the diseases' prevalence, on the bur-

den posed by them, and on sources and levels (both U.S. and foreign) of research funding. The assessment defines research priorities: It examines the status of research and technology in the major disease areas, identifies areas of promise for continued or increased funding, and presents a series of options for making decisions about research funding, technology development and testing, and other policies regarding tropical diseases. In addition, the assessment develops specific information on the Gorgas Memorial Institute of Tropical Medicine and its research areas and accomplishments.

Project Director: Hellen Gelband 226-2070.

Published: September 1985. Summary available.

Requested by: Senate Committee on Appropriations, and the Subcommittee on Labor, Health and Human Services, Education, and Related Agencies

Carcinogen Regulatory Policy (TM)

Carcinogenic substances
Toxicologic testing

The possibility that our air, drinking water, food, drugs, consumer products, and workplaces may expose us to the risk of contracting cancer has generated considerable concern among U.S. citizens. Responding to that concern, Congress has appropriated money for research to identify carcinogenic substances and has empowered regulatory agencies to ban, limit, or control the use of such substances. Over the past few years, the research and regulatory agencies have devoted considerable effort toward writing policy guidelines concerning how they will determine whether or not a substance causes cancer. The Federal Government, primarily through the National Toxicology Program (NTP), pays for the conduct of toxicologic testing in animals of suspected carcinogens.

This study is addressing these Federal carcinogen policies. Specifically, the study involves a comparison of these policies on a number of technical and scientific points concerning the conduct of animal studies, the procedures used to evaluate the results of those studies, and the ultimate regulatory use of the data from those studies. In addition, the study is examining the results of NTP tests for carcinogenicity, how the regulatory agencies have used those results, and how useful that information has been.

Project Director: Karl Kronebusch 226-2070.

Estimated publication date: Spring 1987.

Requested by: House Committee on Government Operations

Nontraditional Methods of Cancer Management: Science and Policy Issues (R)

Cancer
Biomedical research
Immuno-augmentative therapy

In 1986, it is estimated, more than 900,000 Americans will be diagnosed with cancer, and about half of those people will die from their cancer within 5 years. Conventional cancer treatments, even when successful, can be painful and disfiguring, and of long duration. Each year, thousands of American cancer patients turn to methods of diagnosis and treatment which have not been assessed through the standard scientific process, and for which there is inadequate information on which

to judge their safety and effectiveness. Many healthy people use nontraditional methods, also unproven, which are claimed to prevent the development of cancer.

The Federal Government has not taken a direct role in evaluating or controlling most nontraditional cancer treatments, although both the Food and Drug Administration (FDA) and the National Cancer Institute (NCI) have acted in certain instances. State legislatures have passed laws legalizing the use of treatments that have not been approved by FDA. For instance, by the mid-1970s, laetrile had been legalized in more than 25 States. More recently, in 1981, Immuno-Augmentative Therapy (IAT) was made legal by the Oklahoma legislature, and the Florida legislature passed a law (repealed in 1984) allowing the use of IAT and other unconventional therapies.

In the private sector, the American Cancer Society has been most active in gathering information about nontraditional therapies and disseminating it to the public. Professional societies and patient advocacy groups have also participated in critically informing medical professionals and the public about these treatments. Proponents of unconventional treatments also have information networks through which they disseminate information.

The proposed assessment would: 1) examine the role of public and private sector bodies in evaluating and providing information about nontraditional treatments; 2) critically review the existing literature, both from mainstream science and from the proponents of nontraditional treatments; 3) estimate, if possible, the number of Americans who avail themselves of these treatments and the financial impact on individuals and on health insurers; 4) examine the potential for conducting evaluations of nontraditional treatments that would meet the same standards of evidence required of mainstream treatments; and 5) develop objective guidelines for planning such evaluations. IAT would be used as a case study for the development of guidelines.

Project Director: Hellen Gelband 226-2070.

Estimated publication date: Summer 1988. Interim deliverable: "Immuno-Augmentative Therapy" (CS).

Requested by: House Committee on Energy and Commerce

Assessment of Technologies for Determining Cancer Risks From the Environment (R)

Cancer
Carcinogens
Environmentally induced diseases

The report discusses the strengths and weaknesses of data sources used for determining trends in cancer occurrence and mortality, and reviews estimates of the contribution of various factors—behaviors and exposures—associated with cancer in this country. Evidence linking today's cancers with past carcinogenic influences has come mainly from epidemiology, which continues to scrutinize aspects of the American lifestyle, for possible association with cancer.

The assessment examines the use of extrapolation techniques for estimating human carcinogenic risks from test-derived data; the advantages and disadvantages of the available extrapolation models; and the ultimate use of these techniques in setting standards for controlling exposures under diverse legislation. The report also looks at the prob-

lems of decisionmaking in the face of the often great uncertainties accompanying scientific findings and the proposals for regulatory reform that have grown out of concern for these issues.

Key Contact: Hellen Gelband 226-2070.

Published: June 1981.

Requested by: Committee on Human Resources, Subcommittee on Health and Science Research
Committee on Interstate and Foreign Commerce, Subcommittee on Health and the Environment

Monitoring of Mandated Vietnam Veteran Studies

Chemical exposure
Veterans
Veterans Administration

The epidemiologic study by the Veterans Administration of the long-term health effects resulting from exposure to Agent Orange was mandated in the Veterans Health Programs Extension and Improvements Act of 1979 (Public Law 96-151). The same law requires OTA to approve the study design and monitor the conduct of the study. An advisory panel was assembled to carry out the review. The Centers for Disease Control will carry out the study. OTA will continue to monitor the study and its progress.

Similar responsibilities have been mandated to OTA by legislation relating to "atomic veterans" and to women Vietnam veterans.

Project Director: Hellen Gelband 226-2070.

Estimated publication date: Ongoing.

Requested by: Mandated study

Technology and Handicapped People (R)

Physically handicapped
Technology and social problems

This assessment examines the specific factors that affect the research and development, evaluation, diffusion and marketing, delivery, use, and financing of technologies directly related to disabled people. The problems and processes of the development and use of technologies are analyzed in the context of societal allocation of resources and the setting of goals for public policy. The study concentrates on two critical matching processes: between technological needs and technological capabilities; and between allocation goals or intents and resource capabilities.

Project Director: Clyde Behney 226-2070.

Published: May 1982. Summary available.

Requested by: Senate Committee on Labor and Human Resources

Technology and Child Health (R)

Illness prevention
Nutrition
Prenatal infant screening
Immunizations
Neonatal intensive care
Pediatric home care

This project brings together the current evidence on the effectiveness and costs of health care technologies in promoting and maintaining children's health. It would examine current patterns of availability of these technologies and barriers to their appropriate use. The role of Federal policies, including Medicaid, Maternal and Child Health, and the Women, Infants and Children (WIC) program, in providing access to preventive and therapeutic technologies would be examined.

A range of illness prevention and therapeutic technologies is available at every phase of childhood and the prenatal period. Some, applied in the prenatal period, can reduce the risk of neonatal mortality and morbidity; others, applied later in the child's life, may prevent illnesses that typically manifest themselves in adulthood. But, new medical technology has also transformed formerly fatal childhood diseases into serious chronic illnesses, whose victims remain technology-dependent for extended periods of time. It is often feasible for these children to be cared for in the home, provided financial and supportive resources are available. The availability of these life-saving technologies raises questions about the private and public financing and organization of services for this small but growing population.

The project is emphasizing study of illness prevention technologies, including nonmedical technologies. Among the preventive technologies to be considered are prenatal screening, monitoring, and care; infant screening; immunizations; and early-childhood screening. Therapeutic technologies would include neonatal intensive care and pediatric home care for technology-dependent children.

Project Director: Judith Wagner 226-2070.

Estimated publication date: Spring/Summer 1987. Interim publications:
"Technology Dependent Children" (TM)
"Ambulatory Tocodynamometry" (CS)

Requested by: House Committee on Energy and Commerce
Senate Committee on Labor and Human Resources
Senate Committee on Finance

Children's Mental Health: Problems and Services (BP)

Mental health

The mental health needs of children are unique. Although estimates of the number of emotionally disturbed children vary, the President's Commission on Mental Health estimated that 5 to 15 percent of all children and adolescents (i.e., anywhere from 3 to 9 million children) require some type of mental health service. The most recently available data suggest that fewer than 1 million children actually receive any type of mental health services. In addition, the level and type of service provided to children may sometimes be inappropriate.

This background paper will address the following areas: 1) scope of the problem, including estimates of the numbers of children (those under 18) in need of mental health services and the types of problems affecting children; 2) mental health services available to children; 3) effectiveness of the various mental health treatments and the appropriate mix of mental health services for children; 4) the roles third-party coverage and the Federal and State governments play in the provision of mental health services for children; and 5) identification of areas for further research, and analysis of possible approaches to research and the provision of care.

Project Director: Denise Dougherty 226-2070.

Published: January 1987.

Requested by: Senate Committee on Appropriations

Indian Health Care (R)

Indian health care

Despite some improvement, the health status of American Indians and Alaska Natives remains substantially below that of the general U.S. population. Because of the Federal Government's special responsibilities for the delivery and financing of health care for nearly 1 million of the 1.5 million Indians in the United States, Congress continues to be concerned about the quality, appropriateness, accessibility, and financing of such care.

This project is a comprehensive examination of health technologies and services provided to Indians and of whether those technologies and services are appropriate and adequate in view of the health problems of Indians. The assessment: 1) analyzes the quality and adequacy of data on Indian health status, including trends over time; 2) identifies the types and distribution of technologies and services available through the Indian Health Service and other providers; 3) determines the desirable range and methods of delivery of health-related technologies and services, given our conclusions on health status, and compare this range to the current situation; and 4) develops policy options to improve the selection, provision, financing, and delivery of technologies and services to Indian populations.

Project Director: Larry Miike 226-2070.

Published: April 1986. Summary available.

Requested by: House Committee on Energy and Commerce, and the Subcommittee on Health and the Environment
Senate Select Committee on Indian Affairs

Scientific Validity of Polygraph Testing: A Research Review and Evaluation (TM)

Lie detectors

This technical memorandum evaluates the scientific validity and reliability of the polygraph. The evaluation is based on a critical review of all relevant prior research and identifies gaps in existing research and needs for further research.

Key Contact: Denise Dougherty 226-2070.

Published: November 1983.

Requested by: House Committee on Government Operations
Senate Committee on Armed Services

Prospective Payment Assessment Commission

Medicare

The Prospective Payment Assessment Commission (ProPAC) is an independent advisory committee mandated under the Social Security Amendments of 1983 (Public Law 98-21) which reforms the Medicare program payment method for inpatient hospital services.

Under the statute, the OTA Director is charged with selecting the Commission members. Initial Commissioners were appointed in 1983 and each year since then the Director has made reappointments or appointed new Commissioners to fill openings created by Commissioners' terms expiring. Six Commissioners' terms expired in March of 1986,

and the OTA Director made four reappointments and two new appointments. The Director appointed two new members to ProPAC in August, because the number of Commissioners was increased from 15 to 17 by the Consolidated Omnibus Budget Reconciliation Act of 1985 (Public Law 99-272).

OTA is also required to report to Congress annually on the functioning and progress of the Commission. A panel of outside experts was selected to assist in this process. The second of these reports was issued this past year.

Key Contact: Clyde Behney 226-2070

Physician services
Medicare
Physician payment

Physician Payment Review Commission

The Physician Payment Review Commission (PhysPRC) is also an independent advisory committee mandated under the Consolidated Omnibus Budget Reconciliation Act of 1985 (Public Law 99-272). PhysPRC's purpose is to advise Congress and the Executive Branch on possible ways of reforming physician payment under the Medicare program.

As with ProPAC, under the statute, the OTA Director is charged with selecting the Commission members. The initial 11 Commissioners were appointed in June 1986, to terms ranging from 1 to 3 years. In October 1986, the Director appointed two new members to the Commission in response to the Sixth Omnibus Budget Reconciliation Act (Public Law 99-509) which increased the number of Commissioners from 11 to 13. An annual report is also required on PhysPRC.

Key Contact: Clyde Behney 226-2070

Communication & Information Technologies (226-2240)

Information Technology Research and Development: Critical Trends and Issues (R)

Computers
Telecommunications
Artificial intelligence
Technology policy

Computer and communication technologies are vital components of the domestic economy. They also form the information services network that supports and enhances productivity in every other sector of the economy. In addition, these technologies are indispensable components of our national security system.

Underlying current U.S. leadership in information technology has been a strong national R&D effort on the part of both government and industry. Traditional patterns of research and development are likely to alter significantly as a result of shifts in industry structure, international competition, and technological advances that are now taking place.

The report characterizes those shifts in R&D, projects their implications for U.S. leadership in computer and communication technology, and analyzes the potential influences of Federal policy on the directions and levels of R&D support.

Key Contact: Fred Weingarten 226-2240.

Published: December 1984. Summary available.

Requested by: House Committee on Science and Technology
House Committee on Energy and Commerce, and its Subcommittee on Telecommunications, Consumer Protection, and Finance

Artificial Intelligence R&D/Machine Translation of Scientific and Technical Information (BP)

Artificial intelligence
Machine translation

This background paper will examine the current state of R&D in artificial intelligence, defines the field in terms of the principal current fields of work, and assesses the role of Federal funding in advancing the technology. It will also examine the state of machine translation technology and its potential application for the international exchange of technical information.

Project Director: Fred Weingarten 226-2240.

Estimated publication date: Spring 1987.

Requested by: House Committee on Science and Technology

Scientific Use of Supercomputers (BP)

Supercomputers

This background paper assesses progress in Federal efforts to make supercomputers available to the U.S. scientific research community. It explores issues of impacts on technology development, facility management, software development, and networking.

Project Director: Prue Adler 226-2240.

Published: March 1986.

Requested by: House Committee on Science and Technology

Microelectronics Research and Development (BP)

Microelectronics

This background paper examines the current state of microelectronics technology. It assesses the impact of Federal and private R&D support on both in advancing further silicon-based device technology and in developing the potential of newer technologies such as gallium arsenide.

Key Contact: Fred Weingarten 226-2240.

Published: March 1986.

Requested by: House Committee on Science and Technology

Automation of America's Offices (R)

Computer networks
Office technologies
Information services

Increasing use of word processing systems, desktop computers, optical disks, telecommunications, and other forms of office automation is likely to significantly affect public and private sector office environments. These advanced office technologies can increase productivity. Over the long term, automated equipment and systems will be integrated within the office, through local area networks, and the transmission of information generated and/or manipulated within these networks across long distances by means of enhanced communication services.

Widespread utilization and integration of information and communication technologies are likely to change the organization of the office, the structure of office occupations (and their inherent skill levels), the location of work, and the numbers of individuals employed. This raises issues of interest to Federal policymakers concerned with U.S. economic conditions, research and development, industrial policy, telecommunications policy, employment, education and training, Federal procurement and management, and privacy and security of information. This assessment analyzes these developments and describes their implications for public policy.

Project Director: Vary Coates 226-2240.

Published: December 1985. Summary available.

Requested by: Senate Committee on Labor and Human Resources
House Committee on Education and Labor

Computerized Manufacturing Automation: Employment, Education, and the Workplace (R)

Automation
Manufacturing industries
Industrial robots
CAD/CAM systems

New computer and communication technologies are providing the foundation for a new wave of industrial automation, including such technologies as computer-aided design (CAD), computer-aided manufacturing (CAM), robotics, and manufacturing management systems. These technologies can be merged to form flexible manufacturing systems.

While computerized (or "programmable") automation is expected to enhance the productivity and competitiveness of industries that use it, it is also likely to have significant, broader impacts on the Nation's economy, industrial structure, and work force. Computerized automation will thus present both opportunities and problems to Federal policymakers concerned with the state of the U.S. economy, international

trade, employment, and training programs. This assessment examines these developments and analyzes their implications for public policy.

Key Contact: Fred Weingarten 226-2240.

Published: April 1984. Summary available.

Requested by: Joint Economic Committee
Senate Committee on Commerce, Science, and Transportation
Senate Committee on Labor and Human Resources
House Committee on Science and Technlogy

Science, Technology, and the Constitution in the Information Age (R)

Constitutional principles
Scientific advancement
Technological development

This project, which will be completed during the Constitutional Bicentennial Year of 1987, will examine the way in which constitutional principles have provided both stability and flexibility during two turbulent centuries of scientific advancement and technological development. By expanding our knowledge of the universe and by extending our ability to intervene in natural processes, science and technology often create new questions about how fundamental constitutional principles and precedents apply to new technological capabilities and the social changes that they stimulate or reflect.

Scientific knowledge and science-based technology increasingly play a central role in our society, as the United States begins the third century of its constitutional history in 1987. The project will examine illustrative new or emerging technologies and discuss the ways in which they may challenge traditional understanding of constitutional guarantees, or provide new possibilities for assuring the values and goals expressed in constitutional provisions.

Project Director: Vary Coates 226-2245

Estimated publication date: Winter 1987-88.

Requested by: House Committee on the Judiciary.

Communications Systems for an Information Age (R)

Information technologies
Information storage
Computers

Recent advances in information storage and transmission technologies, occurring in a new deregulated and intensely competitive economic climate, are rapidly reconfiguring the Nation's communications networks. The revolution in computers and communications technology has already transformed the regulation and market structure of the industry, dramatically changing the way in which information is created, processed, transmitted, and made available to individual citizens and institutions. These technologies hold promise for a greatly enhanced communications system, which can meet the changing communications needs of an information-based society. How these technologies will evolve will depend on decisions being made now in both the public and private sectors. This study will provide a context for evaluating these decisions, and will help Congress to decide on the proper Federal role.

The assessment will explore the role the Federal Government might play in this area, with particular emphasis on the issues raised by technological advances. This study will: 1) characterize the new communi-

cation technologies and explore the intricacies of coordinating them, 2) identify their potential for meeting changing communications goals and needs, 3) discuss conflicts that might stem from their development and use, and 4) examine new communications systems abroad and their potential relationships to the U.S. system.

Project Director: Linda Garcia 226-2247

Estimated publication date: Fall 1988

Requested by: House Committee on Energy and Commerce

Intellectual Property Rights in an Age of Electronics and Information (R)

Intellectual property
Information technologies
Electronics

This report examines the impact of recent and anticipated advances in communication and information technologies on the intellectual property system. It focuses primarily on the Federal copyright system, and on the continuing effectiveness of copyright law as a policy tool in the light of technologies such as audio- and videorecorders, computer programs, electronic databases, and telecommunication networks. To obtain a comprehensive view, the study examines the intellectual property system from a number of perspectives: the constitutional basis of intellectual property policy; the system's goals, laws, and economics; the creative environment; problems of enforcement; the international context; and the Federal role in administering intellectual property rights.

Project Director: Linda Garcia 226-2240.

Published: April 1986. Summary available.

Requested by: Senate Committee on the Judiciary, Subcommittee on Patents, Copyrights, and Trademarks
House Committee on the Judiciary, and its Subcommittee on Courts, Civil Liberties, and the Administration of Justice

Federal Government Information Technology: Electronic Surveillance and Civil Liberties (R)

Privacy and security
Electronic surveillance
Data transmission
Information services
Invasion of rights

Public policy on the use of information technology to electronically monitor individual movements, actions, and communications has been based on balancing civil liberty versus law enforcement or investigative interests. New technologies—such as data transmission, electronic mail, cellular and cordless telephones, and miniature cameras—have outstripped the existing statutory framework for balancing these interests.

The primary focus of this report is on technological developments in the basic communication and information infrastructure of the United States that present new or changed opportunities for vulnerabilities to electronic surveillance, not on the details of specific surveillance devices. The primary policy focus is on domestic law enforcement and investigative applications, not on foreign intelligence and counterintelligence applications.

This report addresses four major areas: 1) technological developments relevant to electronic surveillance; 2) current and prospective Federal agency use of surveillance technologies; 3) the interaction of technol-

ogy and public law in the area of electronic surveillance, with special attention to the balancing of civil liberty and investigative interests; and 4) policy options that warrant congressional consideration, including the amendment of existing public law to eliminate gaps and ambiguities in current legal protections.

Project Director: Fred Wood 226-2240.

Published: October 1985.

Requested by: Senate Committee on Governmental Affairs
House Committee on the Judiciary, Subcommittee on Courts, Civil Liberties, and the Administration of Justice

Federal Government Information Technology: Management, Security, and Congressional Oversight (R)

Computer modeling and decision support
Electronic information exchange
Computer crime
Computer networking

The primary focus of this report is on management, use, and congressional oversight of information technology in the Federal Government. Rapid advances in technology—such as microcomputers, computer networking, computer modeling, videoconferencing, and electronic information exchange—are generating many new applications, opportunities, and issues that warrant congressional attention.

The report addresses five major areas: 1) management of information technology, including strategic planning, innovation, procurement, and the information resources management concept; 2) information systems security and computer crime; 3) information technology and decision support; 4) management of government information dissemination; and 5) opportunities for using information technology in conducting congressional oversight.

Project Director: Fred Wood 226-2240.

Published: February 1986.

Requested by: Senate Committee on Governmental Affairs
House Committee on the Judiciary, Subcommittee on Courts, Civil Liberties, and the Administration of Justice

Federal Government Information Technology: Electronic Record Systems and Individual Privacy (R)

Privacy
Civil liberty
Computer matching
Electronic networking
Computer-based profiles

Public policy on the protection of personal information collected, maintained, or disseminated by the Federal Government has been based on a balancing of the privacy of individual citizens versus management efficiency and law enforcement. New technological applications—such as the computerized matching of two or more sets of records, extensive electronic networking of diverse computerized record systems, and preparation of computer-based profiles on specific types of individuals—are challenging the existing statutory framework for balancing these interests.

This report addresses four major areas: 1) technological developments relevant to government record systems; 2) current and prospective Federal agency use of electronic record systems; 3) the interaction of tech-

nology and public law relevant to protecting privacy; and 4) possible policy actions that warrant congressional attention.

Project Director: Fred Wood 226-2240.

Published: June 1986.

Requested by: Senate Committee on Governmental Affairs
House Committee on the Judiciary, Subcommittee on Courts, Civil Liberties, and the Administration of Justice

Federal Government Information Technology: The Social Security Administration and Information Technology (SR)

Social Security Administration
Computers
Information technology
Privacy
Security

The Social Security Administration is one of the largest users of informational technology in the Federal Government. This case study examines the history of SSA's use of computers and the implications for current issues such as management, procurement, privacy, security, and congressional oversight.

Project Director: Vary Coates 226-2240.

Published: October 1986.

Requested by: Senate Committee on Governmental Affairs
House Committee on the Judiciary, Subcommittee on Courts, Civil Liberties, and the Administration of Justice

New Communication Technologies: Implications for Privacy and Security (R)

Information technology
Telecommunications

The Federal Government, the largest single user of information technology equipment, faces major changes in the nature and uses of communication technology. New generations of the products—such as local and wide area networks, software-controlled switching, digital communications integrated with computers, and satellite and fiber optic transmission—provides greater capability to managers and users for accessing, manipulating, and transmitting information. In addition, the government, like the private sector, is rapidly expanding the number of ways it uses information technology to accomplish its business. At the same time, the industries and institutions that develop and sell these products are changing, forcing major adjustments in government management strategy. These new capabilities and uses challenge the integrity of the government's information system. The assessment will examine new and prospective capabilities of communication technology, assess their impact on privacy and security, and analyze how the combination of technical, administrative, and legal safeguards can cope with privacy and security implications.

Project Director: Charles Wilk 226-2240.

Estimated publication date: Spring/Summer 1987. Interim publications:
"Electronic Monitoring of Office Work;"
"Integrity of Electronic Communicaton and Computer Information."

Requested by: House Committee on Government Operations
House Committee on the Judiciary, Subcommittee on Civil and Constitutional Rights

Technology, Public Policy, and the Changing Nature of Federal Information Dissemination (R)

Public information
Information technology
Data collection
Scientific and technical information exchange
Electronic document filing
Computerized databases
Electronic remote printing

The importance of public information functions of the Federal Government has been recognized since the founding of the Republic. Public information, that portion of government information that is not personal, proprietary, or classified (or otherwise subject to the Freedom of Information Act exemption), is vital to the missions of virtually every agency of the executive branch and committee of Congress, and, more broadly, to science, education, the economy, and an informed citizenry. Public information runs the gamut from reports, periodicals, directories, and handbooks; to scientific and technical information, statistical data, satellite imagery, and computer models; to maps, charts, and photographs.

Use of information technology—such as electronic document filing, computer-aided surveys, computerized databases, optical disks, electronic mail, electronic remote printing, and electronic bulletin boards—is already affecting and could ultimately revolutionize the public information functions of government. However, the use of such technology is complicated because of tensions involving public access, the sometimes conflicting roles of Federal agencies in disseminating public information, management efficiency and cost reduction, and private sector cooperation and competition.

The study will: identify and describe the current institutional base for Federal dissemination of public information (and related data collection and analysis activities); assess the current technological base and future technical developments; evaluate present and future public information needs and how technology might help meet such needs; and identify and analyze key issues and options. These will include, for example, possible future public information roles of the Government Printing Office, executive agencies, libraries, and private firms; policies for public access to Federal information, including policies on depository library and statistical information; quality of Federal information; and opportunities for innovative use of information technology in, for example, electronic remote printing of Federal reports, electronic access to Federal databases, and scientific and technical information exchange.

Project Director: Fred Wood 226-2244.

Estimated publication date: Winter 1987-88.

Requested by: Joint Committee on Printing
House Committee on Government Operations, and its Subcommittee on Government Information, Justice, and Agriculture

Oceans & Environment (226-2155)

New Clean Air Act Issues (R)

Air pollution
Urban ozone
Hydrocarbon emissions
Acid rain

This OTA assessment will focus on air pollution concerns that are among the most contentious issues facing Congress in its attempt to reauthorize the Clean Air Act. The first is urban ozone. Currently the health-based air quality standard for ozone is being exceeded in about 70 urban regions, areas in which about one-third of the population of the United States lives. EPA estimates that about half of the areas will still not be in attainment by the 1987 deadline required by the Act. Second, the assessment will address the closely related problem of regional oxidants (primarily ozone), pollutants that can lower the productivity of agricultural and forested regions and contribute to violations of health-based ambient air quality standards in urban areas, often far from the sources from which the pollutants are formed. Next, while evaluating the cost-effectiveness of controlling various sources of hydrocarbon emissions for lowering ozone levels, the assessment will also identify which of these hydrocarbons might also be toxic air pollutants. Finally, the assessment will update OTA's ability to analyze new options for controlling acid rain, the major focus of an earlier assessment.

Project Director: Bob Friedman 226-2131.

Estimated publication date: Spring 1988.

Requested by: Senate Committee on Environment and Public Works
House Committee on Energy and Commerce, and its Subcommittee on Health and the Environment

Protecting the Nation's Groundwater From Contamination (R)

Groundwater
Water pollution control

Groundwater resources presently supply about 25 percent of all freshwater requirements in the United States, including about 50 percent of domestic drinking water needs. At the same time, the Nation is increasing its use of the subsurface for waste disposal and other nonwaste-related purposes that are threatening the quality of the groundwater resource. Groundwater contamination that can be attributed to human activity is being detected nationwide and with increasing frequency, and it can have serious and long-lasting impacts on human health, the environment, and local and regional economies.

This study provides a comprehensive technical framework to assist Congress in understanding and addressing the major groundwater contamination issues facing the Nation. Issues examined include the nature and extent of groundwater contamination problems, present efforts and capabilities to detect, correct, and prevent contamination, and Federal and State protection activities. It also addresses key Federal policy options.

Key Contact: Bob Niblock 226-2046.

Published: October 1984 (2 volumes). Summary available.

Requested by: Senate Committee on Environment and Public Works

Acid Rain and Transported Air Pollutants: Implications for Public Policy (R)

Transported air pollutants
Acid rain
Ozone

The controversy over transported air pollutants—of which acid rain is one example—revolves around concerns over damage to lakes and streams, forests and soils, agricultural crops, building materials, and human health. Some individuals and groups believe that more stringent measures should be taken now by Congress to control pollutant emissions. Others, pointing to the uncertainties in our knowledge of the causes and consequences of transported air pollutants, are concerned that such action may be premature.

The assessment characterizes the potential benefits of acting now to abate long-range transported air pollution and the potential costs of action that may be premature. The study: 1) identifies the resources potentially at risk, as well as the societal concerns about the loss of these resources; and 2) identifies broad pollution control strategies, and discusses their costs, potential effectiveness, and societal effects. It discusses a range of plausible, regionally oriented impact scenarios that describe the potential environmental and social consequences of transported pollutants, and actions that might be taken to control them. These scenarios do not attempt to "forecast" the future, but instead present a range of plausible consequences of these changes, in terms responsive to near-term congressional decisions.

Project Director: Bob Friedman 226-2131.

Published: June 1984. Summary available.

Requested by: House Committee on Energy and Commerce
Senate Committee on Environment and Public Works

Managing the Nation's Commercial High-Level Radioactive Waste (R)

Solid waste
Radioactive waste disposal
Nuclear fuel reprocessing

More than three decades into the nuclear age, this country still has no permanent disposal facilities for commercial high-level radioactive waste. This assessment focuses on technologies for storage, transportation, and disposal of commercial high-level waste (spent fuel or solidified waste from reprocessing). It also considers the major institutional factors involved in carrying out a radioactive waste management program over a period of many decades. This report describes major policy issues that were resolved by the Nuclear Waste Policy Act of 1982, and concludes that the act provides sufficient authority for the safe storage and disposal of commercial high-level radioactive waste. It also analyzes other key issues that remain to be addressed in the radioactive waste mission plan to be prepared by the Department of Energy, or in subsequent legislation.

Key Contact: Bob Niblock 226-2046.

Published: March 1985. Summary available.

Requested by: Senate Committee on Commerce, Science, and Transportation
Senate Committee on Energy and Natural Resources
House Committee on Foreign Affairs
House Committee on Merchant Marine and Fisheries, and its Subcommittee on Oceanography
House Committee on Science and Technology

Technologies for Exploring and Developing U.S. Exclusive Economic Zones (R)

Seabed development
Marine resources
Petroleum/nonfuel minerals
Remote sensing

The United States assumed control of ocean resources within 3 billion acres of the Exclusive Economic Zone (EEZ) seaward 200 miles in 1983. Prospects for petroleum and nonfuel mineral resources within the EEZ are considered to be high, but little is actually known of the seabed resource potential within this vast area. Exploration and survey of the EEZ requires highly sophisticated remote sensing both above and below the ocean. The job is enormous and is expected to be very expensive. Several questions are key to the assessment and development of living and nonliving resources and the protection of the marine environment: 1) What is currently known about marine resources and their associated environments in the EEZ? 2) What are the current activities in charting, surveying, exploring, and conducting research in the EEZ? 3) What technologies are required to explore and develop marine resources? 4) What would be needed to ensure environmental protection in the event of seabed development? 5) in what economic context should the marine resources of the EEZ be placed in reference to world markets and the economy? and 6) Are there international implications for developing seabed resources in the margins of the EEZ?

Project Director: James Curlin 226-2077.

Estimated publication date: Spring/Summer 1987.

Requested by: House Committee on Merchant Marine and Fisheries, and its Subcommittee on Oceanography, and the Subcommittee on Panama Canal/Outer Continental Shelf
House Committee on Science and Technology

Wastes in Marine Environments (R)

Waste disposal
Waste management

Debates about waste disposal in the Nation's marine waters have usually focused on the intentional dumping of sewage sludge, industrial wastes, dredged material, and radioactive material. These waters, however, also are used for the disposal of large quantities of other wastes such as industrial and municipal effluents.

This assessment is examining the role of different marine waters—estuaries, coastal waters, and the open ocean—in waste management. The study will: 1) evaluate the importance of these activities in different marine waters; 2) evaluate their importance relative to pollutants from nonpoint sources (such as runoff); and 3) evaluate the role of marine waters on a technical basis—whether they can be used for disposal and, if so, under what conditions and with what technologies. Finally, it will evaluate programs that regulate pollutant levels in wastes and programs that address the general quality of marine waters.

Project Director: Howard Levenson 226-2132.

Estimated publication date: Spring 1987.

Requested by: House Committee on Merchant Marine and Fisheries, and its Subcommittee on Merchant Marine, and Subcommittee on Oceanography
House Committee on Public Works and Transportation, and its Subcommittee on Water Resources
Senate Committee on Commerce, Science, and Transportation

Ocean Incineration: Its Role in Managing Hazardous Waste (R)

Hazardous wastes
Waste disposal
Waste management

The American approach to managing hazardous wastes is undergoing rapid change. A decade ago Congress passed the Resource Conservaton and Recovery Act, formally recognizing the costs of past, indiscriminate land disposal. The Nation now is moving with some urgency toward development and greater utilization of methods that destroy, treat, recycle, or reduce the generation of hazardous wastes.

This assessment addresses several issues related to the incineration of wastes at sea: the adequacy of regulations, risks to human health and the marine environment relative to risks of comparable activities, existing and emerging alternatives, the capabilities and limitations of ocean incineration in managing hazardous wastes, and how its use mght affect efforts to develop superior waste treatment and reduction practices. Particular attention is addressed to areas of intense public concern over the use of this technology.

Project Director: Howard Levenson 226-2132.

Published: August 1986. Summary available.

Requested by: House Committee on Merchant Marine and Fisheries
House Committee on Public Works and Transportation
Senate Committee on Commerce, Science, and Transportation
House Committee on Science and Technology

Oil and Gas Technologies for the Arctic and Deepwater (R)

Coastal areas
Offshore development
Petroleum industry
Ocean resources

Offshore oil and gas resources are expected to play a major role in future U.S. energy supplies. Most of these petroleum resources are expected to be found in Alaska and the deepwater of the continental shelf. Exploration and development in these frontier regions are extremely expensive; therefore very large discoveries are needed to be economical. Exploration in the frontier regions of the Atlantic Ocean and offshore Alaska has largely been disappointing. As a result, the expectations of finding offshore resources have been lowered.

The study explores the range of technologies required for exploration and development of offshore energy resources and assesses associated economic factors and financial risks. It also evaluates the environmental factors related to energy activities in frontier regions and considers important government regulatory and service programs.

Project Director: James Curlin 226-2077.

Published: May 1985. Summary available.

Requested by: House Committee on Interior and Insular Affairs, and its Subcommittee on Mining, Forest Mangement, and Bonneville Power Administration
House Committee on Merchant Marine and Fisheries, and its Subcommittee on Oceanography, and the Subcommittee on Panama Canal/Outer Continental Shelf

Assessment of Maritime Trade and Technology (R)

Maritime transportation
International trade
Shipbuilding

World trade now totaling nearly $2 trillion—a fourfold increase in the past two decades—has become a dominant factor in the economic performance of both industrialized and developing countries. The international shipping industry exists to serve that trade. In the past two decades its capacity has grown almost 250 percent, as well as changed in character in response to new trading conditions and cargo demand. However, both trade and shipping volume reached a plateau in recent years, and the industry's concerns about meeting demands for growth have been replaced by concerns about managing overcapacity and improving efficiency. Prospects for merchant shipping and shipbuilding therefore must be evaluated in terms of these changing trade patterns.

This assessment of maritime trade and technology traces prevailing conditions and dominant trends that are important to the way the Federal Government assumes its responsibility for developing and implementing policy. The report contains analyses of the world outlook of trade, shipping, and shipbuilding. It identifies the extent of U.S. participation in these enterprises. It analyzes the U.S. shipping and shipbuilding industries and identifies certain weak and strong attributes. It discusses trends in technology as well as in the policies of the United States and of our major trading partners.

Project Director: Peter Johnson 226-2066.

Published: October 1983. Summary available.

Requested by: House Committee on Merchant Marine and Fisheries
House Committee on Ways and Means

Alternative Cargo Policies (BP)

Cargo policies
Maritime industry
Ocean shipping
World trade

The United States increasingly depends on international trade and shipping to maintain a healthy economy. As trade has grown in importance, so too has the Federal Government's role in assuring fair and equitable U.S. participation in international shipping.

This background paper identifies four issue areas that appear to be important not only to the health and vitality of the U.S. shipping industry, but also to other national interests involving world trade. These areas include: 1) U.S. cargo preference, 2) multilateral cargo sharing, 3) bilateral cargo sharing, and 4) national defense needs that affect cargo policy.

Project Director: Peter Johnson 226-2066.

Published: August 1985.

Requested by: Senate Committee on Commerce, Science, and Transportation, Subcommittee on Merchant Marine
House Committee on Merchant Marine and Fisheries, Subcommittee on Merchant Marine

R&D in the Maritime Industry (BP)

Maritime industry
Research and development
Shipbuilding

This study investigates those institutional or policy issues that broadly influence the quantity and quality of R&D in the United States. The study focuses on issues such as the effect of the tax, patent, and antitrust laws on research activities by the maritime industry. It also examines the ability of the current Federal organizational structure to provide a focus for maritime R&D and to stimulate industry participation in this program.

Project Director: Peter Johnson 226-2066

Published: May 1985.

Requested by: Senate Committee on Commerce, Science, and Transportation
House Committee on Merchant Marine and Fisheries, Subcommittee on Merchant Marine

Marine Applications of Fuel Cell Technology (TM)

Marine applications
Fuel cells
Powerplants

This technical memorandum is an adjunct to OTA's overall assessment of maritime technology and draws on the study, *New Electric Power Technologies: Problems and Prospects for the 1990s*. It includes a review of the state-of-the-art of fuel cells and possible future uses in main or auxiliary powerplants for ships and other marine vehicles or systems.

Project Director: Peter Johnson 226-2066.

Published: February 1986.

Requested by: Senate Committee on Commerce, Science, and Transportation

The Border War on Drugs (R)

Illegal drugs
Radar
Sensing devices

Control of illegal drugs entering the United States from foreign countries is an important part of Federal drug law enforcement efforts. The detection and seizure of drugs at U.S. borders depends on a number of advanced technologies, including radar and other sensing devices and specialized ships and aircraft. The Customs Service and the Coast Guard, the two agencies with primary responsibility for monitoring U.S. borders, are devoting an increasing share of their resources to intercepting illegal drugs.

A number of other Federal agencies—including the Drug Enforcement Administration, the Border Patrol, Federal Aviation Administration, and the Department of Defense—assist interdiction programs. Technical and organizational improvements could increase the effectiveness of drug interdiction efforts. There are proposals to purchase additional equipment for Customs Service and Coast Guard programs; to develop and introduce new, more sophisticated technical systems; and to increase military assistance through the loan of military hardware and greater participation of armed forces personnel in drug control activities. This assessment will evaluate current and proposed technologies for drug interdiction, their cost-effectiveness, and their most appropriate use in controlling illegal drug traffic.

Project Director: Peter Johnson 226-2066.

Estimated publication date: Winter 1986-87.

Requested by: Senate Committee on Appropriations

Science, Education, & Transportation (226-2214)

Science Policy Special Projects

Demographic Trends and the Scientific and Engineering Work Force (TM)

Scientific and engineering work force
Economic competitiveness
National security

The key role of the Federal Government in educating and assuring an adequate supply of scientists and engineers has been acknowledged since the close of World War II. Scientists and engineers represent only 3 percent of the national work force, but are considered by many to be crucial in the Nation's efforts to improve its economic competitiveness and national security.

This technical memorandum examines the implications of long-term demographic trends for scientific and engineering personnel policy, and analyzes also the barriers to and future trends in the participation of women and minorities in scientific and engineering careers.

Key Contact: Nancy Naismith 226-2214.

Published: December 1985.

Requested by: House Committee on Science and Technology

The Regulatory Environment for Science (TM)

Scientific and engineering research

The vitality of American science is a principal component of our country's economic and intellectual success. Congress, among other institutions, bears responsibility for nurturing creativity and exploration in science while providing appropriate safeguards. Various direct and indirect forces, however, are continually altering the agenda for scientific endeavor, its methods and practices, and the dissemination of results. It is therefore essential that Congress, in providing direction and funding for science at the Federal level, understand these forces and how they are changing.

This technical memorandum examines the social and legal forces that act to restrict or regulate scientific and engineering research in the United States.

Key Contact: Nancy Naismith 226-2214.

Published: February 1986.

Requested by: House Committee on Science and Technology

Research Funding As An Investment: Can We Measure the Returns? (TM)

Research funding
Economic competitiveness
Scientific research

Several trends have combined in recent years to make policymakers more interested in economic and other quantifiable measures of research success and benefits. Technology is becoming an evermore essential component of economic competitiveness; Federal budget constraints are forcing lawmakers to reevaluate spending and to look for ways to compare the value of widely divergent government programs. Quanti-

fication of program success offers the hope for an objective measure that could simplify politically contentious decisions about increasingly esoteric and complex scientific research. One approach to simplifying research evaluation is to view Federal research spending as an investment that should produce measurable economic return.

This technical memorandum examines the models and other analytical tools developed by economists to judge capital investments, and the applicability and use of these models and tools to government funding of scientific research.

Key Contact: Nancy Naismith 226-2214.

Published: April 1986.

Requested by: House Committee on Science and Technology

U.S.-Soviet Cooperation in Space (TM)

Space activities
Space cooperation
National security
Technology transfer

U.S.-Soviet cooperation in space comprises a combination of scientific, foreign policy, and national security issues. It is influenced by a background of strained, unpredictable, and ambiguous relations between the two countries overall, and by the fact that international scientific and technological cooperation and the civilian and military uses of space have become complex and contentious issues in their own right.

In light of conflicting currents in U.S.-Soviet relations, therefore, balancing competing objectives and different perceptions of the U.S.S.R. will be a major challenge in determining the shape and magnitude of future U.S.-Soviet cooperation in space. The memorandum discusses four central issues: 1) the scientific and practical benefits that can be gained from space cooperation, 2) the potential transfer of militarily sensitive technology or know-how between the two countries, 3) the effect of space cooperation on foreign policy, and 4) perceptions about Soviet motivations and behavior and the course of U.S.-Soviet relations overall.

Project Director: Nancy Lubin 226-2009.

Published: July 1985.

Requested by: Senate Committee on Foreign Relations

Civilian Space Stations and the U.S. Future in Space (R)

Space stations
Space policy
Future space programs

Over the past quarter century, the United States has continued to increase its capabilities for operating in space. The President has directed NASA to develop the first elements of long-term in-orbit infrastructure over the next decade in a "space station" program.

OTA examines questions such as the following: What are the leading alternatives for meeting foreseeable national needs for in-orbit infrastructure? How may the private sector be more fully involved in constructing, operating, and using the elements of this infrastructure? What are the prospects for important international collaboration in a space infrastructure program? What are the goals and objectives of the Na-

tion's publicly funded space activities, and how would the character and cost of infrastructure relate to them?

Key Contact: Nancy Naismith 226-2214.

Published: November 1984. Summary available. Interim publication:
"Salyut: Soviet Steps Toward Permanent Human Presence in Space" (TM), published December 1983.

Requested by: Senate Committee on Commerce, Science, and Transportation, and its Subcommittee on Science, Technology, and Space
House Committee on the Budget
House Committee on Science and Technology, and its Subcommittee on Space Science Applications

Airport System Development (R)

Airports
Airline traffic
Air traffic control
Airport funding

The National Airspace System Plan issued by the Federal Aviation Administration (FAA) in January 1982 states that "airport capacity limitations at busy airports will be the constraining element in the National Airspace System." FAA anticipates that few, if any, new air carrier airports will be built in the next 20 years and that capacity expansion of existing airports will be severely limited by the availability and cost of land, concern about the environment and airport noise, and constraints on airport access. OTA assesses the technologies available to increase capacity or improve service at airports and the mechanisms by which the technology can be deployed and brought to bear on the problems of civil aviation.

Project Director: Larry Jenney 226-2177.

Published: August 1984. Summary available.

Requested by: House Committee on Public Works and Transportation

Technology, Innovation, and Regional Economic Development (R)

High-technology industries
Economic growth

In the last 10 to 20 years, several regions of the United States have developed strong local economies based on "high-technology" industry—fast-growing firms engaged in the systematic development and commercialization of new products, processes, and services. Several Federal policies are aimed at encouraging the growth of these firms and the industries they compose. Many State and local development programs are also based in part on strategies for attracting or stimulating the formation of small high-technology companies.

The assessment investigates where high-technology firms are appearing and the factors that influence their location. It also examines the effectiveness of State and local initiatives to encourage innovation and high-technology development; and it addresses the appropriate Federal role in affecting the conditions for future growth.

Key Contact: Nancy Naismith 226-2214.

Published: Final report released July 1984. Interim publications:
"Census of State Government Initatives for High-Technology Industrial Development" (BP), published May 1983;
"Encouraging High-Technology Development" (BP), published February 1984.

Requested by: House Committee on Science and Technology

Safety in the Commercial Aviation and Motor Carrier Industries (R)

Aviation safety
Truck safety

Over the past 8 years, the commercial aviation and motor carrier industries have restructured. The increased number of carriers and freedom to set rates have brought intense competitive pressures to keep costs down. The study will examine whether transportation safety is being maintained at an appropriate level within the new industry structures. Questions to be addressed are:

- What new or existing technologies can be utilized to improve safety?
- Is sufficient safety data available and is that information analyzed in an appropriate manner?
- Are Federal safety standards appropriate, and are these standards being adequately enforced?

The OTA study will analyze aviation and truck safety separately, but simultaneously, and will result in two final reports, one for each of the two modes.

Project Director: Edith Page 226-2175

Estimated publication date: Summer 1988

Requested by: House Committee on Government Operations, Subcommittee on Government Activities and Transportation
House Committee on Public Works

Transportation of Hazardous Materials (R)

Hazardous materials
Waste transportation

The safe transportation of the 4 billion tons of hazardous commodities and radioactive and chemical wastes shipped annually is a concern at all levels of government. This assessment is directed toward these fundamental issues:

- the data and information systems for tracing commodity and waste transport and accident reporting,
- the adequacy of the containers used in hazardous materials transportation, and
- training needs for emergency response and enforcement personnel.

It examines the roles of Federal, State, and local governments in these areas. The assessment suggests alternatives for improved management of hazardous materials transportation, and develops a range of policy options.

Project Director: Edith Page 226-2175.

Published: July 1986. Summary available.

Requested by: Senate Committee on Commerce, Science, and Transportation
House Committee on Government Operations, Subcommittee on Government Activities and Transportation
House Committee on Energy and Commerce, Subcommittee on Commerce, Transportation, and Tourism
House Committee on Public Works and Transportation

Transportation of Hazardous Materials: State and Local Activities (SR)

Waste transportation
Hazardous materials

This special report documents the concerns of State and local governments about the transportation of hazardous materials, including waste. The report includes findings about State and local needs in prevention and enforcement, emergency response and training, and information gathering for planning purposes. Exemplary existing programs in each of these areas are described.

Project Director: Edith Page 226-2175.

Published: March 1986.

Requested by: Senate Committee on Commerce, Science, and Transportation
House Committee on Government Operations, Subcommittee on Government Activities and Transportation
House Committee on Energy and Commerce, Subcommittee on Commerce, Transportation, and Tourism
House Committee on Public Works and Transportation

Educational Technology: An Assessment of Practice and Potential (R)

Educational technology
Computer-assisted instruction
Telecommunications
R&D

The use of microcomputers in elementary and secondary education has grown dramatically; there are now more than 1 million computers in over 85 percent of American public and private schools. In many cases, computer-based systems are coupled with advanced telecommunications and video technologies. These systems have the potential to deliver instruction, reinforce basic skills, overcome physical and linguistic handicaps to learning, and enhance educational program effectiveness. OTA will analyze the wide range of instructional technologies in American schools.

The study will focus on several factors that influence effective implementation of the technology. These factors include federally funded programs for educationally and economically disadvantaged children, various approaches to teacher training, incentives and/or barriers to developement of appropriate software, State, local, and private sector initiatives, and research and development. The study will review policy options designed to maximize uses of educational technologies toward the goals of improved learning and preparation for productive futures.

Project Director: Linda Roberts 226-2166

Estimated publication date: Spring 1988

Requested by: House Committee on Education and Labor, and its Subcommittee on Select Education

Sustaining the National Technological Base: Education and Employment of Scientists and Engineers (R)

Scientific and engineering work force
Education
Employment
Scientific and engineering research

This study will identify and analyze factors affecting the education and employment of scientists and engineers over the next two decades. The objective of this analysis is to describe the dynamic interactions between public policies, private actions, and the Nation's changing research work force.

The first phase of the study will review supply and demand data for individual scientific and engineering disciplines. Key trends and factors shaping supply and demand for scientific and engineering disciplines will be identified. These factors will be analyzed in detail in the second part of the study. This analysis will focus on the education "pipeline" from precollege through early career; on the institutions that recruit, channel, and certify students in science and engineering; and on academic and industrial needs for faculty and researchers, which dominate demand for scientists and engineers.

Project Director: Daryl Chubin 226-2080.

Estimated publication date: Spring 1988; interim deliverable, Winter 1986.

Requested by: House Committee on Science and Technology

Index by Subject Category

Agriculture and Forestry

Acid Rain and Transported Air Pollutants: Implications for Public Policy (R) *58*
Africa Tomorrow: Issues in Technology, Agriculture, and U.S. Foreign Aid (TM) **30**
Commercial Biotechnology: An International Analysis (R) *27*
Impacts of Applied Genetics: Micro-Organisms, Plants, and Animals (R) *27*
Innovative Biological Technologies for Lesser Developed Countries (WP) **30**
Integrated Renewable Resources Management for U.S. Insular Areas (R) **31**
Low-Resource Agriculture in Developing Countries (R) **31**
A Special Report for the 1985 Farm Bill (SR) **33**
Technologies To Benefit Agriculture and Wildlife (WP) **32**
Technologies To Maintain Biological Diversity (R) **33**
Technology, Public Policy, and the Changing Structure of American Agriculture (R) **32**
U.S. Grain-Handling Technologies and Export Quality Standards (BP) **30**
Wetlands: Their Use and Regulation (R) **62**

Biological Applications

Alternatives to Animal Use in Research, Testing, and Education (R) **29**
Assessment of Technologies for Determining Cancer Risks From the Environment (R) *47*
Carcinogen Regulatory Policy (TM) *47*
Classification Systems for Decisionmaking for Critically Ill Elderly Patients (BP) **24**
Commercial Biotechnology: An International Analysis (R) **27**
Decisionmaking on Behalf of Elderly Patients (BP) **26**
Disorders Causing Dementia (R) **25**
Federal Policies and the Medical Devices Industry (R) *35*
Hearing Impairment and Elderly People (BP) **23**
Human Gene Therapy (BP) **28**
Impacts of Applied Genetics: Micro-Organisms, Plants, and Animals (R) **27**
Impacts of Neuroscience (BP) **24**
Infertility Prevention and Treatment (R) **28**
Innovative Biological Technologies for Lesser Developed Countries (WP) *30*
Life-Sustaining Technologies and the Elderly (R) **25**
New Developments in Biotechnology (R) **26**
Preventing Illness and Injury in the Workplace (R) *35*
Reproductive Health Hazards in the Workplace (R) **28**
Technologies for Detecting Heritable Mutations in Human Beings (R) *40*
Technologies for Managing Urinary Incontinence (CS) *38*
Technologies To Maintain Biological Diversity (R) *33*
Technology and Aging in America (R) **23**
Technology, Public Policy, and the Changing Structure of American Agriculture (R) *32*

Defense

Alternative Cargo Policies (BP) *61*
Alternatives for Improving NATO's Defensive Response (R) **21**
Anti-Satellite Weapons, Countermeasures, and Arms Control (R) **21**
Ballistic Missile Defense Technologies (R) **20**
Demographic Trends and the Scientific and Engineering Work Force (TM) *63*
Effects of Nuclear War (R) **21**
International Cooperation and Competition in Civilian Space Activities (R) *19*

Bold type indicates primary reference; *italics* indicates secondary reference.
R = Report; TM = Technical Memorandum; BP = Background Paper; CS = Case Study; SR = Special Report; WP = Workshop Proceedings

Scientific Validity of Polygraph Testing: A Research Review and Evaluation (TM) 50
Strategic Defense Initiative: Survivability and Software (R) 20
Strategic Materials: Technologies To Reduce U.S. Import Vulnerability (R) 14
Technologies for Exploring and Developing U.S. Exclusive Economic Zones (R) 59
Technology Transfer to China (R) 20
Technology Transfer to the Middle East (R) 19
U.S.-Soviet Cooperation in Space (TM) 64

Education and Training

Computerized Manufacturing Automation: Employment, Education, and the Workplace (R) .. 52
Demographic Trends and the Scientific and Engineering Work Force (TM) 63
Displaced Homemakers: Programs and Policy (R) 17
Hazardous Materials Transportation: Technology Issues (R) 66
Informational Technology and Its Impact on American Education (R) 53
Regulatory Environment for Science (TM) 63
Strengths and Weaknesses of Standardized Tests as Measurement Tools for Federal Education Policy (TM) 66
Sustaining the National Technological Base: Education and Employment of Scientists and Engineers (R) 67
Technology and Structural Unemployment: Reemploying Displaced Adults (R) 16
Technology and the American Economic Transition (R) 7

Energy and Mineral Resources

Competitiveness of the Domestic Copper Industry (R) 10
High-Technology Ceramics and Polymer Composites (R) 12
Magnetic Fusion Research and Development (R) 8
Marine Applications of Fuel Cell Technology (TM) 61
New Electric Power Technologies: Problems and Prospects for the 1990s (R) 8
Nuclear Power in an Age of Uncertainty (R) 9
Oil and Gas Technologies for the Arctic and Deepwater (R) 60
Potential Effects of Section 3 of the Federal Coal Leasing Amendments Act of 1976 (SR) ... 11
Strategic Materials: Technologies To Reduce U.S. Import Vulnerability (R) 14
Technological Risks and Opportunities for Future U.S. Energy Supply and Demand (R) 13
Technologies for Exploring and Developing U.S. Exclusive Economic Zones (R) 59
Technology Transfer to the Middle East (R) 19
U.S. Natural Gas Availability: Gas Supply Through the Year 2000 (R) 9
U.S. Vulnerability to An Oil Import Curtailment (R) 10
Western Surface Mine Permitting and Reclamation (R) 11

Environment and Pollution

Acid Rain and Transported Air Pollutants: Implications for Public Policy (R) 58
Assessment of Technologies for Determining Cancer Risks From the Environment (R) 47
Carcinogen Regulatory Policy (TM) 47
Hazardous Materials Transportation: Technology Issues (R) 66
Impacts of Applied Genetics: Micro-Organisms, Plants, and Animals (R) 27
Magnetic Fusion Research and Development (R) 8
Managing the Nation's Commercial High-Level Radioactive Waste (R) 59
New Developments in Biotechnology (R) 26
Oil and Gas Technologies for the Arctic and Deepwater (R) 60
Potential Effects of Section 3 of the Federal Coal Leasing Amendments Act of 1976 (SR) ... 11
Protecting the Nation's Groundwater From Contamination (R) 58
Reduction of Industrial Hazardous Waste (R) 15

Bold type indicates primary reference; *Italics* indicates secondary reference.
R = Report; TM = Technical Memorandum; BP = Background Paper; CS = Case Study; SR = Special Report; WP = Workshop Proceedings

Superfund Strategy (R) 14
Technologies and Management Strategies for Hazardous Waste Control (R) 15
Technologies for Exploring and Developing U.S. Exclusive Economic Zones (R) 59
Technologies for Prehistoric and Historic Preservation (R) 12
Wastes in the Marine Environment: Their Management and Disposal (R) 59
Wetlands: Their Use and Regulation (R) 62

Health

Abstracts of Case Studies in the Health Technology Case Study Series 35
Acid Rain and Transported Air Pollutants: Implications for Public Policy (R) 58
Assessment of Technologies for Determining Cancer Risks From the Environment (R) 47
Blood Policy and Technology (R) 39
Boston Elbow (CS) 36
Carcinogen Regulatory Policy (R) 47
Children's Mental Health: Problems and Treatment (BP) 49
Classification Systems for Decisionmaking for Critically Ill Elderly Patients (BP) 24
Contact Lens Industry: Structure, Competition, and Public Policy (CS) 37
Cost-Effectiveness of Digital Subtraction Angiography in the Diagnosis of Cerebrovascular Disease (CS) 43
Decisionmaking on Behalf of Elderly Patients (BP) 26
Diagnosis-Related Groups (DRGs) and the Medicare Program: Implications for Medical Technology (TM) 42
Disorders Causing Dementia (R) 25
Effectiveness and Costs of Alcoholism Treatment (CS) 41
Effects of Federal Policies on Extracorporeal Shock Wave Lithotripsy (CS) 43
Efficacy, Safety, and Cost Effectiveness of Continuous Ambulatory Peritoneal Dialysis (CS) 45
Federal Policies and the Medical Devices Industry (R) 35
Hearing Impairment and Elderly People 23
Hemodialysis Equipment and Disposables Industry (R) 37
Human Gene Therapy (BP) 28
Impact of Randomized Clinical Trials on Health Policy and Medical Practice (BP) 38
Impacts of Neuroscience (BP) 24
Indian Health Care (R) 49
Infertility Prevention and Treatment (R) 28
Intensive Care Units: Costs, Outcome, and Decisionmaking (CS) 42
Life-Sustaining Technologies and the Elderly (R) 25
Market for Wheelchairs: Innovations and Federal Policy (CS) 37
Medical Technology and Costs of the Medicare Program (R) 41
Medicare's Prospective Payment System: Strategies for Evaluating Cost, Quality, and Medical Technology (R) 44
Monitoring of AIDS-Related Activities 40
Monitoring of Mandated Vietnam Veteran Studies 47
Nuclear Magnetic Resonance (NMR) Imaging Technology: A Clinical, Industrial, and Policy Analysis (CS) 36
Nurse Practitioners, Certified Nurse Midwives, and Physician Assistants: Quality, Access, Economic, and Payment Issues (CS) 46
OTA's First Report on the Prospective Payment Assessment Commission (SR) 44
OTA's Second Report on the Prospective Payment Assessment Commission (SR) 44
Payment for Physician Services: Strategies for Medicare (R) 45
Physician Payment Review Commission (R) 50
Preventing Illness and Injury in the Workplace (R) 35
Procurement and Evaluation of Medical Devices by the Veterans Administration (TM) 38
Protecting the Nation's Groundwater From Contamination (R) 58

Bold type indicates primary reference; *italics* indicates secondary reference.
R = Report; TM = Technical Memorandum; BP = Background Paper; CS = Case Study; SR = Special Report; WP = Workshop Proceedings

Reproductive Health Hazards in the Workplace (R) 28
Review of the Public Health Service's Response to AIDS (TM) 40
Status of Biomedical Research and Related Technology for Tropical Diseases (R) 46
Strategies for Medical Technology Assessment (R) 39
Superfund Strategy (R) 14
Technologies for Detecting Heritable Mutations in Human Beings (R) 40
Technologies for Managing Urinary Incontinence (CS) 38
Technology and Aging in America (R) 23
Technology and Child Health (R) 48
Technology and Handicapped People (R) 48
Technology Transfer to the Middle East 19

Industry and Employment

Alternative Cargo Policies (BP) 61
Artificial Intelligence Research and Development (BP) 51
Assessment of Maritime Trade and Technology (R) 60
Automation of America's Offices (R) 52
Boston Elbow (CS) 36
Commercial Biotechnology: An International Analysis (R) 27
Competitiveness of the Domestic Copper Industry (R) 10
Computer-Based National Information Systems: Technology and Public Policy Issues (R) 53
Computerized Manufacturing Automation: Employment, Education, and the Workplace (R) 52
Contact Lens Industry: Structure, Competition, and Public Policy (CS) 37
Demographic Trends and the Scientific and Engineering Work Force (TM) 63
Displaced Homemakers: Programs and Policy (R) 17
Effectiveness and Costs of Alcoholism Treatment (CS) 41
Effects of Federal Policies on Extracorporeal Shock Wave Lithotripsy (CS) 45
Effects of Information Technology on Financial Services Systems (R) 56
Federal Policies and the Medical Devices Industry (R) 35
Hemodialysis Equipment and Disposables Industry (CS) 37
Impact of Randomized Clinical Trials (RCTs) on Health Policy and Medical Practice (BP) 38
Impacts of Applied Genetics: Micro-Organisms, Plants, and Animals (R) 27
Information Technology Research and Development: Critical Trends and Issues (R) 51
Intellectual Property Rights in An Age of Electronics and Information (R) 53
International Competition in the Service Industries (R) 17
International Competitiveness in Electronics (R) 21
Machine Translation of Scientific and Technical Information (BP) 52
Marine Applications of Fuel Cell Technology (TM) 61
Market for Wheelchairs: Innovations and Federal Policy (CS) 37
Microelectronics Research and Development (BP) 51
New Communication Technologies: Implications for Privacy and Security (R) 56
New Developments in Biotechnology (R) 26
Nuclear Magnetic Resonance (NMR) Imaging Technology: A Clinical, Industrial, and Policy Analysis (CS) 36
Oil and Gas Technologies for the Arctic and Deepwater (R) 60
OTA's First Report on the Prospective Payment Assessment Commission (SR) 44
Preventing Illness and Injury in the Workplace (R) 35
Reduction of Industrial Hazardous Waste (R) 15
R&D in the Maritime Industry (BP) 61
Reproductive Health Hazards in the Workplace (R) 28
Scientific Use of Supercomputers (BP) 51
Strategies for Medical Technology Assessment (R) 39

Bold type indicates primary reference; *italics* indicates secondary reference.
R = Report; TM = Technical Memorandum; BP = Background Paper; CS = Case Study; SR = Special Report; WP = Workshop Proceedings

Sustaining the National Technological Base: Education and Employment of Scientists and Engineers (R) ... 67
Technological Risks and Opportunities for Future U.S. Energy Supply and Demand (R) ... 13
Technology and Child Health (R) ... 48
Technology and Structural Unemployment: Reemploying Displaced Adults (R) ... 16
Technology, Innovation, and Regional Economic Development (R) ... 65

Information Technology and Services

Artificial Intelligence Research and Development (BP) ... **51**
Automation of America's Offices (R) ... **52**
Computer-Based National Information Systems: Technology and Public Policy Issues (R) ... **53**
Effects of Information Technology on Financial Services Systems (R) ... **56**
Federal Government Information Technology: Case Study of the Social Security Administration (SR) ... **55**
Federal Government Information Technology: Electronic Record Systems and Individual Privacy (R) ... **55**
Federal Government Information Technology: Electronic Surveillance and Civil Liberties (R) ... **54**
Federal Government Information Technology: Management, Security, and Congressional Oversight (R) ... **54**
Impact of Randomized Clinical Trials on Health Policy and Medical Practice (BP) ... 38
Informational Technology and Its Impact on American Education (R) ... **53**
Information Technology Research and Development: Critical Trends and Issues (R) ... **51**
Intellectual Property Rights in An Age of Electronics and Information (R) ... **53**
International Cooperation and Competition in Civilian Space Activities (R) ... 19
Machine Translation of Scientific and Technical Information (BP) ... **52**
Microelectronics Research and Development (BP) ... **51**
New Communication Technologies: Implications for Privacy and Security (R) ... **56**
Scientific Use of Supercomputers (BP) ... **51**
Scientific Validity of Polygraph Testing: A Research Review and Evaluation (TM) ... **50**
Strategic Defense Initiative: Survivability and Software (R) ... 20
Strategies for Medical Technology Assessment (R) ... 39
Technology, Public Policy, and the Changing Nature of Federal Information Dissemination (R) ... **57**
Technology Transfer to China (R) ... 20
Technology Transfer to the Middle East (R) ... 19

International Trade, Competition, and Cooperation

Alternatives for Improving NATO's Defensive Response (R) ... 21
Civilian Space Stations and the U.S. Future in Space (R) ... 64
Commercial Biotechnology: An International Analysis (R) ... 27
Competitiveness of the Domestic Copper Industry (R) ... 10
International Competition in Electronics (R) ... 21
International Competition in the Service Industries (R) ... 17
International Cooperation and Competition in Civilian Space Activities (R) ... 19
Machine Translation of Scientific and Technical Information (BP) ... 52
Magnetic Fusion Research and Development (R) ... 8
New Developments in Biotechnology (R) ... 26
Potential Effects of Section 3 of the Federal Coal Leasing Amendments Act of 1976 (SR) ... 11
Reduction of Industrial Hazardous Waste (R) ... 15
Technologies for Exploring and Developing U.S. Exclusive Economic Zones (R) ... 59
Technologies To Control Illegal Drug Traffic (R) ... 62
Technology Transfer to China (R) ... **20**
Technology Transfer to the Middle East (R) ... **19**
U.S. Grain-Handling Technologies and Export Quality Standards (BP) ... 30
U.S.-Soviet Cooperation in Space (TM) ... 64

Bold type indicates primary reference; *italics* indicates secondary reference.
R = Report; TM = Technical Memorandum; BP = Background Paper; CS = Case Study; SR = Special Report; WP = Workshop Proceedings

Oceans and Water Resources

Alternative Cargo Policies (BP) **61**
Assessment of Maritime Trade and Technology (R) **60**
Integrated Renewable Resources Management for U.S. Insular Areas (R) *31*
Managing the Nation's Commercial High-Level Radioactive Waste (R) *59*
Marine Applications of Fuel Cell Technology (TM) **61**
Oil and Gas Technologies for the Arctic and Deepwater (R) **60**
Protecting the Nation's Groundwater From Contamination (R) **58**
Reduction of Industrial Hazardous Waste (R) *15*
R&D in the Maritime Industry (BP) **61**
Technological Risks and Opportunities for Future U.S. Energy Supply and Demand (R) *13*
Technologies for Exploring and Developing U.S. Exclusive Economic Zones (R) **59**
Technologies To Control Illegal Drug Traffic (R) **62**
Wastes in the Marine Environment: Their Management and Disposal (R) **59**
Wetlands: Their Use and Regulation (R) *62*

Science and Technology R&D

Anti-Satellite Weapons, Countermeasures, and Arms Control (R) *21*
Artificial Intelligence R&D (BP) **51**
Ballistic Missile Defense Technologies (R) *20*
Demographic Trends and the Scientific and Engineering Work Force (TM) **63**
Information Technology Research and Development: Critical Trends and Issues (R) *51*
Magnetic Fusion Research and Development (R) *8*
Microelectronics Research and Development (BP) **51**
Regulatory Environment for Science (TM) **63**
R&D in the Maritime Industry (BP) *61*
Research Funding As An Investment: Can We Measure the Returns? (TM) **63**
Scientific Use of Supercomputers (BP) **51**
Strategic Defense Initiative: Survivability and Software (R) *20*
Sustaining the National Technological Base: Education and Employment of Scientists and Engineers (R) *67*
Technology Transfer to China (R) *20*

Space

Anti-Satellite Weapons, Countermeasures, and Arms Control (R) *21*
Ballistic Missile Defense Technologies (R) *20*
Civilian Space Policy and Applications (R) **65**
Civilian Space Stations and U.S. Future in Space (R) **64**
International Cooperation and Competition in Civilian Space Activities (R) **19**
Strategic Defense Initiative: Survivability and Software (R) *20*
U.S.-Soviet Cooperation in Space (TM) **64**

Transportation

Airport System Development (R) **65**
Civilian Space Policy and Applications (R) *65*
Hazardous Materials Transportation: Technology Issues (R) **66**
Managing the Nation's Commercial High-Level Radioactive Waste (R) *59*
Strategic Materials: Technologies To Reduce U.S. Import Vulnerability (R) *14*
Technologies To Control Illegal Drug Traffic (R) *62*

Bold type indicates primary reference; *italics* indicates secondary reference.
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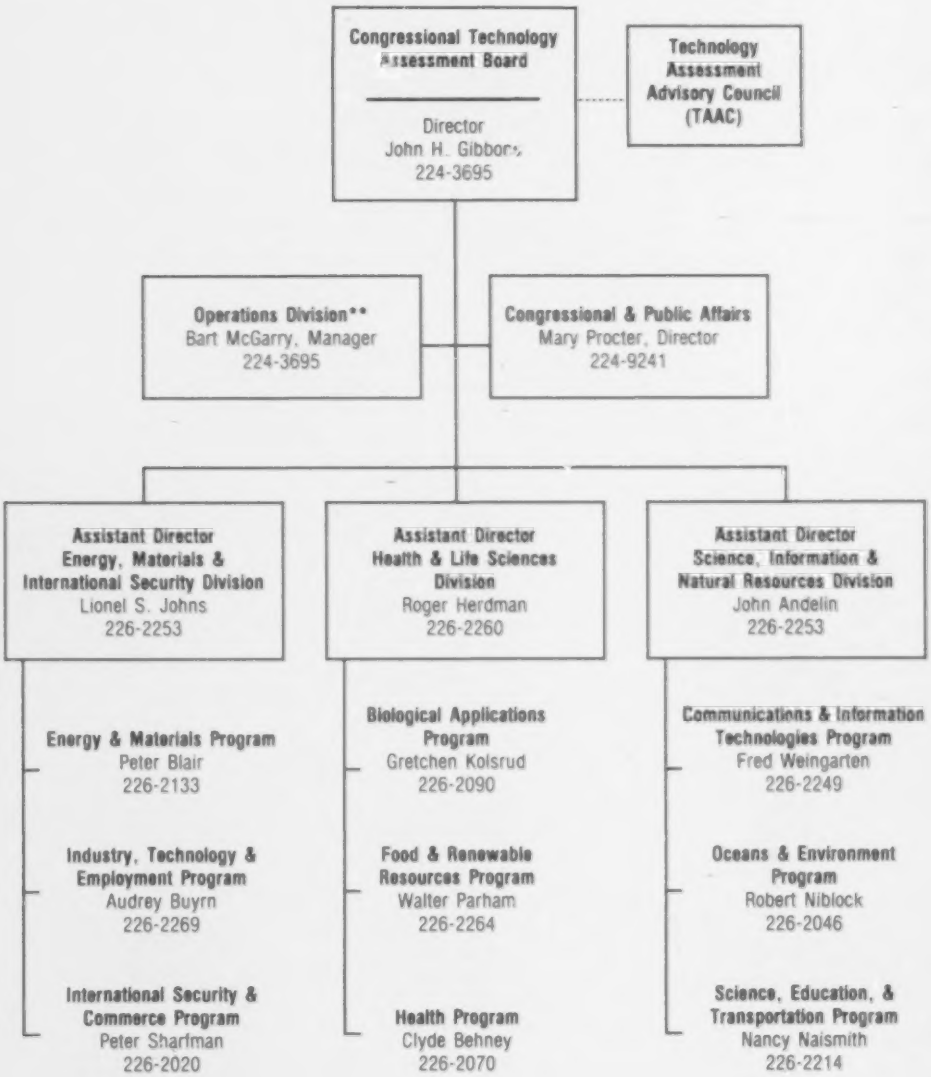
OTA* ORGANIZATION CHART



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